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Open Education Algorithm

Everything is a Matter of Degree

B.K. Passi*

Incubation can be Shared

I began my readings in the area of fuzzy thinking (Kosko, Bart. *Fuzzy Thinking : The New Science of Fuzzy Logic.* London, Flamingo, 1994) and virtual classrooms. I read some essays on artificial intelligence. I got excited. While accepting the basis of these concepts, I wanted to develop new ideas for improving the perspectives of open education by applying techniques like synectics and morphological analysis. I played with a few concepts. I could not pursue this exploration very far. Satisfaction was limited. I felt that I must share with others this thought process. I am also aware of others who say that incubation is indefinite. They also say that incubation is not easily available for conscious description. Many others hesitate to share it. Nevertheless, I felt that incubation of this incomplete experimentation should interest someone. In fact, I feel that verbalization of incubation is a critical factor. It is often very difficult to attempt.

I fully subscribe to the idea of sharing of views even while the illumination through the incubation process has to take place in the mind. I have experienced the advanced level of interactions with Professor E. Paul Torrance (USA), who is a leading authority on the incubation process within the area of creative thinking, while I was working on a *Model of Enhancing Incubation.* Against this background, I began to fool around with the idea of creating something new. With this common understanding between you and me, let me present some of the principles of fuzzy logic and also some ideas related to the three systems of networking.

Everything is a Matter of Degree

The first principle of fuzzy thinking is "Everything is a Matter of Degree". Life is not black and white. There are many shades of gray in it. This first principle of fuzzy thinking comprises elements like bivalence versus multi-valence; precision up and fuzzy up; and distinctness between sciences among scientists. This logic asserts that laws of science are not laws at all. They are neither laws in the sense of logical laws like two plus two equals four, nor are they allowed to become intuitive descriptions in the context. Science restricts itself to observable parts of universe and states tendencies that we have observed in the particular corner of our universe. There is a problem of mismatch between the reality as it exists and reality as described by scientists who are strictly following the ideas of bivalence. Against this characteristic of bivalence of All *Or* None "A *Or* Not-A": the multi-valence view works on the principle of continuum of multiple gray options "A And Not-A".

The split between "Thing" and "No-thing gets complicated when the phenomenon is relative. Consider art, beauty, legal decisions, and similar other concepts; we would find that fuzzy thinking is nearer to reality. Fuzzy technologists will be able to develop machines that will

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be more intelligent. They will be smarter and easier to work with. Fuzzy machines will work with conditional statements. Sensor technology will reinforce the fuzzy revolution. What will be its implications for educational policies and practices? How will it influence the activities of human resource development, certification of the outcomes of human resource process, purposeful human resource utilization, and efficient human resource management.

Fuzzy logic implies that a "brain-like neural network" will work. In this environment operation of a computer system will mimic how a brain learns and recognizes patterns, thus generating fuzzy rules from training data. They learn from the experience "DIRO — Data In Rules Out". Conventional scientists are underplaying the potentialities of fuzzy sciences. In fact, fuzzy logic is helping to solve the problem of mismatch between reality as it exists and reality as being described by binary based codification.

The fuzzy scientists have transcended the conventional concepts of probability. They are questioning the roots of probability? Why do we insist on probability? The fuzzy logician states that probability or randomness is a psychic instinct or mental trend that helps us organize our perceptions, memories and most of our expectations. Probability gives a structure to our competing causal predictions about the future that will unfold in the next instant. The universe is not random. The implications of this assertion are that the universe is deterministic but grey. The chaos theory has already legitimated the deterministic stand. All things happen in a deterministic fashion. Of course, it is exhibited in degrees.

Deterministic labeling is quite difficult. The processes of concept attainment, concept formation and concept naming have evolved in pedagogical literature. One may try to find a link, if any, between these pedagogical emergencies and fuzzy logic. Let us take the concept of a Chair. How does one ensure that one understands the concept of a Chair. Let us accommodate the idea of a Chair — arm chairs, reading chairs, dining-room chairs, and kitchen chairs, chairs that pass for benches, chairs that cross the boundary and become easy chairs, dentist's chairs, thrones, opera stall chairs, seats of all sorts, those miraculous/beautiful pieces of furniture that not only provide comfort to our aching bodies but decorate floors of the arts and crafts exhibitions, and you will see what a difficult task the concept is for the knowledge based systems. I felt defeated while accommodating all such ideas in *one* label called Chair.

Artificial Intelligence Technology

Popularly three main divisions of Artificial Intelligence (AI) technology are available for determining structures for any sector including that of distance education. These structures are : (a) Knowledge-based systems (b) Fuzzy logic systems, and (c) neural network systems. Let us briefly overview each of these expert systems one by one.

Knowledge-Based Systems: Knowledge-based systems are very prevalent. This form of Artificial Intelligence technology attempts to use its base of logical, hard-edged, rule-based reasoning as are involved in solving syllogisms, proving theorems, diagnosing faults, choosing antibiotics or playing chess. Such rule-based systems try to emulate the kind of "If... then..." logical thinking which is often used by experts when attempting to solve problems in their own particular domain of expertise. In these *systems,* the rules involved are those of conventional logic, i.e., things are either true or false, yes or no, etc. An example of a rule in knowledge-based system is that if you score lower than 33 per cent marks in a test you are declared a failure.

Fuzzy Logic Systems: Fuzzy logic systems have given rise to new technologies applied in different human endeavours. The theory of fuzzy sets is quite old although we were not using this theory for developing systems. It is only in recent times that we have started using this theory in areas of formulating expert systems. Fuzzy logic replaces the hard-edged aspect of rule-based reasoning with a softer logic that allows for matters of degree, quantity, and uncertainty. This technology attempts to model the kind of logical reasoning that a person engages in when dealing with issues or elements that are not precisely defined and/or that involve aspects of degree or quantity. An example of a fuzzy logic rule that might be found in a fuzzy-logic-based system for human resource development systems can be seen in the work of de Bono. He talks of rock-logic and water-logic. Now, with the help of software, you can build fuzzy systems in minutes. You can go on playing with materials to find new rules for days and nights. You can improve upon the original materials through neural systems. We can use making this type of *search* technique for human brains. Now with this system we have started formulating rules from the data given in gague and cloudy forms. One goes on searching good rules for the game. We can then use the new rules to predict situations that are equally difficult to handle for the knowledge-based systems.

Neural Networks: This technology, also known as the "connectionist" approach, attempts to capture the more intuitive, wholistic kind of thinking involved in, for example, picking out a face in a crowd or recognizing a hand-written character. The technology needs to distinguish the letter A from V. Basically, this thinking can be equated to the subjective processes used by teachers, traders, and pilots. They learn in a Gestalt-like manner from past experiences and, hopefully, generalize such learning for future events. Neural networks are especially useful for tasks involving pattern recognition. A neural network is a set of inter-connected neurons. These are brain-like networks. This system is self-organizing in character. It helps us in identifying fuzzy rules. It is like identifying the patches. A neural net acts like eyes and ears of a higher level of adaptive systems. Unlike fuzzy systems, it does not remain satisfied with the rules evolved so far. A neural system continues to change its rules as and when it samples new data. With more and more examples, the rules go on changing slowly and the system fine-tunes itself. Like brain, the neural system improves with practice. Many authors claim that neural systems can both learn the skills from situations and also explain the skills. Although, not properly a form of Artificial Intelligence, it is rather a form of artificial life. We consider it so because this technology is becoming increasingly popular, and can be very effective when used in combination with the Artificial Intelligence paradigms described above.

What Do We Do?

Out of the combinations of the three network systems, we can find out step-by-step procedures that attempt to model the processes of natural and biological evolution (mating, mutation, recombination, etc) in order to optimize programs, parameters, rules, or virtually anything else that can be properly formalized. For example, genetic algorithms can be used to "breed" (and thus evolve) rule-based trading systems. Sets of rules, which may be considered *individuals*, are mated with other sets of rules to obtain a new, or an offspring of a set of rules. Through recombination, mutation, and occasionally other genetic operations, rules are altered and recombined. Selection is applied to the whole breeding population, weeding out the less fit *rule sets* and leaving behind the more fit *rule sets* to continue with the breeding process. The hope is that the process will eventually lead to individuals (rule sets) that exhibit the desired behaviour, which is defined by the user through a fitness function. Genetic algorithms are not limited to any one of the technologies of Artificial Intelligence. Genetic algorithms may be used to evolve neural networks, rule bases, fuzzy systems, or hybrid entities composed of one or more of these components. To put this in the terms of Artificial Intelligence, genetic algorithms can implement a kind of systematic, and efficient, trial-and-error learning process that involves creation, recombination, and the weeding out of ideas or problem-solving fragments.

Let us examine these ideas in the light of various elements of open education. For distance learners, it looks that we should prepare learning materials by employing the principles and structures of *knowledge-based-systems, fuzzy logic based systems, and neural network systems.* In the context of these three systems, the print, audio, video, and digital modes materials may be developed and tried out in different formats of open education. What could be the possible substance of these materials? We need not specify the substance in advance. However, as an initial trial, we may take up the substance of Action Research. This theme could be useful and acceptable for developing materials for teachers of all levels, all regions, and all subjects. What should be the media-system mix of these materials for specific outcomes? It is quite difficult to address this question here in this note. Perhaps a part of such materials do follow the *knowledge-systems*, another part can follow the *fuzzy-logic system*, whereas the third part can follow the *neuro-network system* for developing the materials. This exercise is challenging yet interesting. I am hopeful that some leading institution or individual can explore these ideas further.

This brings to my mind three models, proposed by Bruner, J.S., for the preparation of the learning materials and also for the models of teaching. By using morphological charts, the three models of teaching using — labeled materials approach, unlabeled materials approach, and unorganized materials approach — could be juxtapositioned against three systems of Artificial Intelligence. The first dimension representing three systems i.e. knowledge-based system, fuzzy-logic system, and neuro-network system will be criss-crossed with the another dimension of our matrix representing labeled materials, unlabeled materials, and uorganized materials. The nine cells in this 3x3 matrix will initiate and accommodate relevant questions related to suitability of pedagogy, and appropriateness of context elements.

TECHNOLOGY MANAGEMENT

Making India More Competitive

B.M. Naik*

"Today success in the global market place means creating and applying new knowledge — which is to say new technology — faster than one's competitors. That is the fundamental law in this competitive world".

— Erich Block
Distinguished Fellw,
Council of Competitiveness

In the present era of globalization and liberalization technology has assumed high importance. It is because technology has become the "Prime Mover" "Push Factor" of progress. So as to win in the world economy, management of this prime mover, namely, the technology, has become the key determinant. It has come to be known as a dominant player changing the life of people. Nobel Laureate Bob Solow of M.I.T. found out that output of US from 1909 to 1949 doubled, and that 85% of growth was attributable to technology change.[1]

It is observed that those nations, organizations and individuals who use latest technology are likely to win. Others may work hard, may have all the resources like raw materials, land, water, money etc at their command, they simply cannot win but lag behind. It is said, when technology drives the competition — which is the case today — you can't win by any other way.

External Pressures Stimulate Competitiveness

Indian industrial environment due to globalization is currently greatly disturbed and passing through a critical phase. Multinational companies are bringing with them more productive technologies and better management practices. They are bringing with them the financial resources from world over and selling the goods and services in the world market. They are giving stiff competition to the Indian companies, on account of which many Indian companies are in difficulty. Some have become sick, some have closed down and some have amalgamated and being purchased by foreign companies. Confederation of Indian Industry (CII), Chambers of Commerce, FICCI have urged the government to give protection to Indian companies. Rahul Bajaj in his article "Role of Industry in Changing Industrial Scenario", said competition is the greatest teacher for improving products, reducing cost, and improving quality. If Indian Industry has to become truly internationally competitive, he feels liberalization is necessary, and it is irreversible.

Good Bye Sunset Technology — Welcome Sunrise

National Council of Applied Economic Research (NCAER), New Delhi[2] has come out with a research study stating that of the 657 companies, started in 1997 in India, 56% are manually operated and 38.7% are semi-automatic. In the same period the study says 80% companies started in Japan are fully automatic and 20% semi-automatic. If Indian investment is being made in industries which are based on outdated technologies, they are handicapped right at birth. How can they be competitive globally? In USA 26% of the capital investment goes in new technology based firms (NTBF) whereas in India NTBF are not at all started. The future wellbeing of companies is judged from the level of technology employed in them. We have to learn, the study says, to invest in hi-tech companies especially NTBF, which demands scientific management of technology.[3]

Strengthen the Technology Absorption Capacity of Enterprises

According to yet another study it is reported that output of an Indian industrial worker per head per year[4] is 1,677 US$, whereas that of a Japanese worker is more than 40,000 US$. Does this mean that the Japanese worker is working hard twenty times more? Certainly not. He is working with an automatic machine and we are working with low level technology. The future of a nation now depends on how we use brain power, technology power instead of muscle power. The low level technology being employed in industry will have to be replaced by hi-tech as early as possible. This shift is not however possible to be achieved so early and easily. It presents many problems like sociological, political, economical, technical besides resistance from unions. People have to unlearn the old methods, skills and knowledge and learn anew. This is also a very difficult task. Colleges,

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Principal, Shri Guru Gobind Singhji College of Engineering & Technology, Nanded-431 603.

universities and learning centres have to reorient themselves, prepare to offer courses and make people interested in learning and becoming more competent. It is said "to cherish traditions, old buildings, cultures and graceful life styles is a worthy thing. But in the world of technology to cling to old outmoded methods of manufacturing, old product lines, old marketing, old attitudes among management and workers is a prescription for backwardness."

Joy of Learning — Strategy for Change

Ther was a time when technology change was slow. A production line once established could last for 20 to 30 years, products could ramain in market quite a long time. The trade or skill learned by a person was enough throughout his life time. But now product life has reduced, production lines have to be altered frequently, people have to learn and relearn again and again life long, non stop. Unless we change all the things scientifically adaptation of technology is difficult. Whenever people have doubt in technology and are hesitant, unions offer resistance, the change is slow and in that case you cannot outwit the competitors. Resistance to change can be reduced by making the organizations and people in them learning. Learning lifelong with joy has to become the culture.

Adaptation to Environment

It is said, "It is not the strongest of the species which survives, nor the most brilliant. It is those species which are most adaptable to change. What is true for species is true for organisations also.

In this period of patenting, IPR, WTO, import of technology is going to be not only difficult but also more costly. The past experience in all developing countries tells us that very often the technology import was ineffective, not relevant to the local conditions besides high cost. The borrower has no bargaining power, for he is technologically too weak[5]. There was hardly any transfer of technology, it was mostly import of machines so said Ashok Desai in his book on Technology Transfer[6]. The absorption of technology and improvement was not all done and could not be possible due to weakness in technological capability of Indian counterparts. Now that many countries are offering variety of technologies, selection of technology has become still more complex. This demands establishment of database at national and state levels.

R&D is Energy Giver — Driving Force

If Indian industry has now to stand to global competition, strategic changes will have to be made at various levels, namely, government, industry, university, and college. We will have to change the mind set. All agencies have to function like organic partners, team players with cohesion, then only they can be more competitive. This cannot be done without studying policies and practices adopted by other countries, which demands scientific technology management. Innovation must be the driving force behind development.

Technology Development, *Swadeshi*, is one alternative, but not the only alternative. Government of India have taken steps by establishing Technology Development Board — Venture capital fund. The colleges, universities, CSIR labs, institutes will have to jack up effort on R&D not in isolation but in collaboration. The companies may compete nationally but they will have to collaborate to face competition internationally.

Are We Ready for Patents and Intellectual Property Regime?

In many backward regions there is no CSIR laboratory. Also companies in such regions have almost no R&D. So also colleges and universities are presently too weak. A special drive by setting up Technology Park, Incubator Centre, Innovation Centre needs to be made so as to serve R&D needs of industries in these regions. This requires money, which will have to be raised partly from government and partly from private sources like bonds and VCF.

For sustainable development of industry, R&D support is very essential.[7] R&D is energy giver to Industry — "more energy, more progress; less energy less progress".

The key to development of industries lies in use of front line technologies. It is said individuals howsoever knowledgeable they are powerless, only the institutions decide the destinies of people. Balanced investment in R&D is necessary to cope with ambitious development of industries. Prof. Terman of Standford University, in 1950, observed that industry needs access to first class research so as to remain competitive. Also he observed that the academicians and researchers need to commercialise the research findings. These observations are more relevant to Indian situation, we have to get Brain Race, patents and IPR.

Returns from Investment in R&D in Engineering Education Institutes is Highest

The recent trend in the world tells us that exclusive research companies are being set up in USA, Germany and Japan. They have realised that it is more profitable to do research, obtain patent and make a sale of technology. Innovation is a wealth creating activity. Government also should increase fuding on R&D especially in engineering colleges with technology transfer and patent departments.

Often govt. is advising private industry to invest more in R&D, and giving them tax concessions. R&D is an "Energy Giver" activity, "Profit Center" regardless whether it is done by public sector or private sector. It has to be done by both, more by public sector. R&D done in public sector like in CSIR labs and engineering institutes could become available to people at large. It is published, displayed and made available to young generation and industries. This is not the case with private research, which remains a trade secret of the company and exploited by the company more to its own advantage, at times maybe by ignoring public good. More investment in public sector especially in colleges and universities which is found to be more productive than CSIR labs is the need of the hour. Education, research and extension are inseparable and the combination is most productive.

Francis Bacon in 1605 said, govt. would have to fund basic research, since nobody else would. Funding research by govt. in public institutes goes a long way to improve living standard of common man. Private research helps the rich.

Only Technology Development is Not Enough Rapid Application is Wanted

In the book Competitive Advantage of Nations,[8] the author Michael Porter having studied ten developed countries has answered the question, why some countries are more developed industrially than others? He has concluded that the technical university model is more efficient model, consumes less budget and produces more output, relevant to industrial needs, than general universities. These nations which have more of technical universities are industrially more advanced. We need such technical universities most. This model involves youths in technology development and diffusion which is a rapid means of technology application.

Innovate or Fall Behind

Although at the national level there is a Council for Scientific and Industrial Research, at state level we do not have councils. The innovation and R&D are extremely relevant to removal of poverty in the state and increasing the standard of living. It generates employment so is observed by an OECD study (1990) — more innovation, more employment; less innovation, less employment.

Technology is and will continue to remain a dominating factor of development in the future. It is changing the life of people. Now availability of raw materials, finance, market etc do not decide the feasibility as much as the technology.

The winds of change in technology are blowing very fast and it is necessary to cope with them. Otherwise, the implications are very serious, so serious that the nation may be left permanently behind and will remain one of the poor most even in twenty first century. The need of raising scientific and technological capability of people is very urgent and these aspects must be attended to by key people themselves who matter most for the region. It should not be left to lower levels. It is only through proper scientific[9] technology management that companies can achieve high levels. They must allocate higher budget to R&D or at least more than marketing. In this age we must learn to harness intellectual capital and this strategy pays heavy dividends, so observed *World Development Report 1997.*

How do we Create a Brave New India?

No doubt some difficulties in implementation and management of technology are bound to arise. They need to be studied, analysed and solved, so as to get benefits from new technologies. An attempt will have to be made continuously to see whether the industry is using latest technology. Are we using world class technology? *World Development Report 1997* states that wealth is flowing continuously from developing countries to developed countries, more so from India. They said that they are giving aid to developing countries only 20% of what they are earning from developing countries. This flow of wealth is because of superior technology management, policy and practices. If we want India to be a technology oriented nation, should and can we figure on technology map of the world? We all will have to develop scientific temper and adapt world class technology policies. If we don't do this or even if we delay reforms suggested here the present situation of industry and economy which is already bad is likely to further worsen and more and more industries may have to be closed down. This is a warning signal, which needs to be heard and acted upon forthwith without any loss of time.

Japan Research Development Corporation gives money[10] to various agencies for innovation to be refunded only when innovation is successful. Such measures will have to be thought of and introduced in India. Without base of R&D the Indian industry cannot be competitive. The creation and development of new high-tech firms is a major factor in creating a brave new India.

Conclusion

It is high time to realise that Indian economy can flourish only if there is a culture within the country favourable for innovation, which today is suppressed by political and bureaucratic cultures. The priority for S&T in national budget although increasing is far too inadequate. The respect and prospect for science and technology personnel in India by world standards is far too less. Consequently, there is a brain drain. Research, industry and training are compartmentalised, regulations are deterrent, which stifle the creative talent from blossoming. Innovators are seen as nuisance. Red tape creates lots of obstacles to their creativity. Venture capital to finance innovation is not available and we are shy of failures. Innovation is particularly important for the regions which are lagging behind in development.

Shall we not learn from foreign countries to set up technology diffusion centres, innovation centres, technology parks, incubators which have transformed their economies? Shall we not build bridges between researchers and industrialists?

Management of technology should not now remain a peripheral job of government, industry and institutes, rather it should become central. Countries like Japan, USA have shown the way. Scientific technology management demand that our academic and research institutes launch a drive for "creativity and risk taking". Today they are concerned with only stability and security. A complete departure from status quo to quantum jump is the need of the hour. Innovation based industrial growth, is found to be sustainable and hence has to be the goal. We have not to be complacent till we are known as Leaders in Technology. If we do not make up the lost ground in new technologies we are destined to lose jobs, and rupee value will continue sliding down.

Management of finance, materials, personnel are all important and necessary, but not enough. Management of technology holds the key. Peoples' future depends upon how well technology management, in sum total is done by various agencies within the country. We need to adopt global visions and strategies. Shall India launch a project to encourage NTBF especially by researchers and engineers from institutes.

Technology development within the country is important, but more important is the rapid application of new technology regardless whether it is *swadeshi* or *videshi*. *Swadeshi* is of course preferred; it is cheaper, better, appropriate and user friendly. But in this interdependent world we have to bring new technology from abroad when necessary instead of waiting to develop indigenously.

Our Prime Minister has recently given a call of "*Jai Vigyan*", and underlined the need to launch a nation wide, "Innovation Movement". As a captain he has alarmed the people on board, lest they should be drowned in turbulent waters of globalised competition. Now it is to be seen how soon and how well Prime Minister's vision is translated into action.

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TO OUR READERS

Knowledgeable and perceptive as they are, our contributors must not necessarily be allowed to have the last word. It is for you, the readers, to join issues with them. Our columns are as much open to you as to our contributors. Your communication should, however, be brief and to the point.

MAKING THE TEXT MEAN

Anil Shukla*

Introduction

Liberalisation of Education is not only a fast catching concept, but it is a need of the hour. Distance Education (DE), which can play a major role in making education liberal is dependent heavily upon the learning material. These materials may take many forms like books, worksheets, audio and video tapes, CBT packages, multimedia to name a few. The major difference in the distance education of developed and developing countries is that the former are electronic media oriented and latter and mostly based on print media.

In DE the learning material is put together in such a way that users can learn from them satisfactorily with little or no help from the teacher than normally expected from a teacher. That is why it is called 'Self Instructional Material' (SIM). This SIM generally provides information and expects the learner to act upon it. The whole process of developing SIM is very complex, but let us have a look on important features, which help make SIM meaningful.

Stages in Preparing Material (SIM)

The development of SIM is a very systematic task, which mainly processes through three major stages: i) Planning, ii) Preparing for Writing, and iii) Writing and Rewriting.

Each stage has a number of tasks to be carried out. Rowntree (1994) has suggested the following route map for material preparation.

Stage I : Planning

Profile your learner

- Agree aims and objectives
- Outline the content
- Choose the media
- Plan learner support

Consider existing material

Stage II : Preparing for Writing

Weigh up resources and constraints

- Sequence your ideas
- Develop activities and feedback
- Find examples
- Think graphics

Decide on access devices

Consider physical format

Stage III : Writing and Rewriting

Start your first draft

Complete and edit your first draft

Write assessment material

Pilot and improve your material

Every academician has one's own unique way of creative development of SIM, nevertheless, this route map provides us a cognitive framework for the development of friendly instructional material. Let us discuss each stage in brief to convince ourselves about the developmental process.

Stage-I : Planning

Learner's Profile

In our country no systematic research effort has been made by the DE institutions to know about learners' profile, which causes very serious problems for the success of SIM, as well as a course. An effective SIM developer needs relevant information about the learners regarding the Demographic Factors, Academic (Subject) Background, Reasons for Learning, Learning Styles, Resources available for them etc. For such data institutions should carry out organised survey well in advance. But the SIM developer can also make an effort at the individual level by Consulting colleagues, Interacting with passed out students, Using previous experience, Discussing with prospective students, Getting information through questionnaire, discussion, informal talks etc, and Going through the material used in last years and assignments/answer books submitted by the students.

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Aims and Objectives

Aims and objectives play a very crucial role in SIM. They force the SIM developer to be focused about what is to be accomplished. Objectives enable us to communicate to the learners what they must achieve. They simplify evaluation, make accountability possible and sequencing easier. They also tell learners what they might get out of our material. The question now arises, where are the objectives to come from? Taylor suggested that students, society and subject are the main source of selecting the objectives. For this, SIM developer can do brain storming with colleagues, can discuss with experts, can take the help of learner and can go through the resource materials. After developing the material one can check one's success by raising some queries like Do your objectives communicate to how learners might expect to benefit from the material? Does it cover the scope of the unit? Do they make evaluation process easier? Are the interested parties agreed about the appropriateness of the objectives etc.

Content Framework

Sketching of the outline of the content has always been a challenging task before the SIM developers. The author thinks that consultation with resource material and brain storming with the colleagues, clientele and himself can help a lot in deciding the framework of content. Basically, two approaches are in practice for developing the content i.e (i) Subject centred in which SIM developers review their knowledge of proposed subject, take the help of experts and clients, consult advance material, analyse course and packages on similar subjects etc. (ii) Learner centred in which SIM developers discuss with prospective learners, weigh the cognitive and affective domains of the learners; identify the learners difficulties and study the tutors' remarks on the student performance in previous years etc. SIM develper should not tilt towards one approach. He is expected to maintain a balance, so that he could identify the learners' needs to act accordingly on the content of subject.

Media Selection

Media provide ways and means of facilitating learning. Selection of media is not an easy task. There is always a conflict between what our learners would most benefit from and what we can afford. The best medium is one which fulfils the needs of learners satisfactorily if not perfectly. It is a misconception that high tech medium will always be more effective. Before selecting the media, SIM developer should address to himself the following queries :

— Availability of media

— Required skills to use the media

— Matching of the media with the objectives and content

— Do not apply media for the sake of media

— Consider the effect of media on the performance of learners.

SIM developer should foresee as to which objectives and portions of content can be dealt with well enough by printed material and which should be supplemented by other media. For example if the objective is to provide a carefully argued analysis of a subject, then perhaps print, audio and lecturing can be used effectively. However to provide each learner a unique personal feedback, the services of computer, multimedia, telephone, comments on assignments can be made use of.

Plan to Learner Support

SIM developer has also to keep in mind as to how other academic activities can help the learner with this self instructional material. At the time of the course learner may be confused about the selection of learning material, co-operative learning, evaluative procedure etc. He needs guidance & feedback to perform well. To fulfil these requirements SIM developer develops a 'blue print' to identify the support areas and resources which can meet the needs.

Considering Existing Material

At this point, SIM developer considers/seeks about the utility of (same type) material which is already available on different academic centres and institutions. For example, if IGNOU has developed a course, which KOU also wants to start it would be cost effective and beneficial for KOU if it utilises the existing material of IGNOU. But to make the material suitable for the local context, it should be tested on the group of population objectives, assessment procedure, coverage, credit, time, teaching methods, physical format, reputation costs, compatibility with other alternatives etc.

Stage-II : Preparing for Writing

At this stage, the expectations of the clientele, availability of the resources, expected constraint and time management must be foreseen. As far as the present author could gather the experience, the time schedule may be managed as below :

Table 1 : Time Schedule for developing SIM

Stages	*Sub stages*	*% of total time*
I Planning (20%)	- Learners profile	3
	- Aims/Objectives	5
	- Content Framework	5
	- Media selection	3
	- Learner support	1
	- Considering existing material	3
II Preparing for Writing (30%)	- Check-up of the Resources/Constraints	2
	- Sequencing of ideas	5
	- Develop activities and feedback	10
	- Examples	5
	- Graphics/Cartoons	6
	- Access device	1
	- Physical format	1
III Writing and Rewriting (50%)	- First draft	20
	- Editing of first draft	5
	- Self evaluation and assessment	10
	- Pilot and improve your material	15

Sequencing of Ideas

Every person has some creative ideas but it is not easy for all to sequence the ideas in a logical form. At this crucial stage SIM developer should keep these three points in mind — i) Main points which are to be covered, ii) Order of points, sub-points, and iii) Overall structure.

There are several approaches of sequencing (Derek Rowntree) Random sequencing, Chronological sequencing, Concentric sequencing, Cause and effect sequencing, Structural, Problem centred, Spiral sequencing etc. SIM developer can use any one or more of them for sequencing their ideas.

Activities and Feedback

SIM is meant to be active in learning. For active example, learner needs feedback from inside or outside. Activity and also feedback plays a vital role in helping the students of DE. Preparation of activity based material is a time consuming task. This material should be developed in such a challenging way, so that students could be curious at all the time and they take it as a motivated learner. Reflect action guide approach can help a lot in developing such type of SIM.

Explanations and Illustrations

Explanations make learning material easy, interesting and motivating. Learners of distance mode can have difficulty in grasping abstract ideas, thus they need help of illustrations. Even in classroom teaching, successful teachers always teach through examples. Analogies, similarities, short stories, jokes, real objects, charts, comments, anecdotes can be used as forms of examples. The use of examples in SIM is quite significant that's why 6% of total time of developing the lesson has been recommended to think about the different form of examples to include in the learning material.

Graphics and Cartoons

A few lines of cartoons and graphics can depict even a very serious theme so easily, for which even a long article may not be sufficient. A cartoonist's approach can both cheer the reader and help get your message across. IGNOU had successfully applied this approach in the development of PGDHE (Post Graduate Diploma in Higher Education) course material. In scientific teaching and analysis, graphics convey very direct message to learners. SIM developer should give considerable time to think about how he can express learning material more graphically and pictorially than in long prose to make the text really mean.

Access Device

Access device means, how to grasp the material. How are the students to find their way around in it? Through this device students must be informed about the unit structure, numbering system, instruction about what to do next, verbal signpost, graphic signals (white space, reader stopper's, bullets, tints, boxes, icons), media combination, menus, screen heading-route map (computer based training packages) etc. They should also be told about off campus learning strategies if it is part of the learning package. Actually access device provides a route map to help learners organise different components/activities of the unit.

Physical Format

Physical format includes front page (outer shape) paper quality, binding, printing, colour printing, paper size margin, print style, print face, space and length of lines, packaging etc. The physical format of SIM should be alternative otherwise students will pick them up with low expectations.

Stage III : Writing and Rewriting

This is the final stage of developing the SIM. Fifty per cent of the total time should be dedicated to this stage. Let us discuss the steps of this stage to give the final shape to the SIM of distance mode.

First Draft

The wisest approach of drafting is to think first and write afterwards. In SIM you always have to keep in mind, that your target is a learner, you have to have a dialogue with him by asking questions, keeping interaction and making him busy with activity oriented exercise. It would be heart touching, if you refer yourself as 'I' and learner as 'you'. Be welcoming your students and keeping on your learners wave-length with references, examples etc. Prefer active form, keep sentences/paragraphs short and structure simple to be reader friendly. Readability also has to be kept in mind. Gunning (1968) had suggested the following formula of measuring readability based on the fog index :

— Calculate the average number of words per sentence in a passage.

— Add on the percentage of words with three or more syllables.

— Multiply by 0.4.

If result is more than 12, your text could be too difficult for most of your readers.

Editing First Draft

This sub stage is concerned with introspection. The SIM developer has to recheck whether his objectives are sufficiently explicit, activities related to objectives are clear, complete and sequenced logically, the language of presentation has the wavelength on the right pitch of the learners, teaching structure is manageable, media combination, introduction, summaries, assessment procedure have been rightly followed. For all this SIM developer can also take help and seek comments from colleagues, critical friends, prospective learners and clients etc to furnish his material.

Assessment Material

In SIM self evaluation keeps, the learner motivated, enthusiastic and in high spirits. It provides focus to learners efforts. In distance mode learning material we simply use two types of assessment approach —

Product assessment	(Assessment through questions, Project reports etc.)
Performance assessment	(Assessment through activity oriented/making the thing)

In the planning of assessment questions, content area, purpose, time, evaluation system and feedback procedure should be kept in mind.

Pilot and Improvement in Material

Piloting is sometimes called developmental testing. Until and unless our contribution has been tried and tested on the real client, one cannot be sure about its acceptability and validity. Mostly two forms of piloting are in practice (a) face to face try out, and (b) field trials. It is not only the course developer who is interested in the evaluation of the material but the colleagues, clients, several academic committees, editor, accrediting bodies etc can also have equal interest in monitoring the materials. Collecting feedback and making continuous changes accordingly makes the material immortal.

Summing Up

A brief discussion has been attempted about the process of developing the self instruction material for distance mode students. There is nothing new, we all are aware of these steps, but the conscious effort has been to make the SIM developers more sensitive and systematic for the learners of open distance and flexible learning, so that they could lighten the lamp of knowledge with self efforts.

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The Progress of Education of SCs and STs in the Faculty of Education and Psychology in the M.S. University of Baroda

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Introduction

After independence India has accepted the democratic values and planned efforts are made for the social and economic development of the nation. Such an effort would necessitate, that, care must be taken of all sections of the Indian society. It is with this in view, that, the Indian Constitution provides an ideal of 'Equality of Opportunities'.

Education Commission (1964-66), also observes and states, "one of the important social objectives of education is to equalize opportunity enabling the backward and under privileged classes and individuals to use education as a lever for the improvement of their conditions Every society that values social justice and is anxious to improve the lot of talent, must ensure equality of opportunity to all sections of society."

The National Policy on Education (1986), states that, "the new policy will lay emphasis on the removal of disparities and to equalize educational opportunity by attending to the specific needs of those who have been denied equality so far."

Accordingly efforts have been made to improve their position by making provisions for freeships, scholarships and reservations etc in educational institutions. In Teacher Education colleges also these facilities have been extended to the deprived sections of the society. Among deprived sections also, the Scheduled Castes (SCs) and Scheduled Tribes (STs) are at the bottom of the deprivation. Although, serious efforts have been made to improve the position of SC and ST students, but, to what extent they have progressed is a question worth investigating. In order to study the progress of SCs and STs, the relevant data were used from the project undertaken by Kumar (1997), viz., "Investigation into the Problems of SC and ST Students of Professional Courses : Medical, Engineering and Teacher Education in The M.S. University of Baroda." The present paper is based on this project report. Main objectives and the methodological details are as follows.

Objectives of the Study

The main objectives of the study are :

1. To study the enrolment of SC and ST students in the Faculty of Education and Psychology.
2. To study the rate of dropout and failure of SC and ST students in the Faculty of Education and Psychology.
3. To study the problems faced by the SC and ST students during the course of their studies.

Methodology

In order to study the progress of SC and ST students during four years, that is, 1992-93, 1993-94, 1994-95, and 1995-96, data were obtained with respect to enrolment and rate of failures. For identifying the problems which these students face during their course of studies a questionnaire was developed by the investigator and it was personally administered by the investigator to the students who were studying in the Faculty during the year 1996-97. The results of this survey are presented here.

Enrolment of SC and ST Students in Faculty of Education and Psychology

The first and foremost indicator of educational progress of SC and ST students in the field of Teacher Education is their enrolment. In order to find out the extent of enrolment of SC and ST students, 4 years admission data were obtained from the Faculty of Education and Psychology. The results indicate, that, students from both the categories have been studying in the Teacher Education. (Table 1).

S. No.	*Year*	*No. of Students Admitted*	*Number of Students*		*Total*	*Percentage*
			SC	*ST*		
1	1992-93	196	10	13	23	11.73
2	1993-94	179	16	26	42	23.46
3	1994-95	192	20	09	29	15.10
4	1995-96	195	14	20	34	17.44
	Total	762	60	68	128	16.80

Table 1 : Enrolment of SC and ST Students in the Faculty of Education and Psychology

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With respect to the enrolment of SC and ST students, it can be observed from Table 1, that, during the years 1992-93, 1993-94, 1994-95, and 1995-96 out of the total number of students admitted 11.73 per cent, 23.46 per cent, 15.10 and 17.44 per cent in the respective years belonged to SC and ST categories. On an average, 16.80 per cent of students in the Teacher Education were admitted from the SCs and STs. The extent of enrolment is little lower in case of SCs, out of the total enrolment 07.87 per cent were admitted from SCs and 08.92 per cent were admitted from STs. However, it may be viewed against the representation of SCs and STs in the total population of Gujarat which is 7.18 per cent for SCs and 14.22 per cent for STs.

The enrolment data were also analyzed with respect to sex. It was revealed by the results, that, out of the total number of SC and ST students admitted in Teacher Education about 36.72 per cent were girls and 63.28 per cent were boys. The enrolment of girls was found higher in case of STs. In case of STs 39.71 per cent were girls and 60.29 per cent were boys whereas in case of SCs 33.33 per cent were girls and 66.67 per cent were boys.

Regarding, the enrolment of SC and ST students it can be concluded, that, the students from the deprived communities have made progress in the field of Teacher Education as large number of boys and girls have enrolled in the courses like Teacher Education. The percentage-wise representation of Scheduled Caste and Scheduled Tribes in the state of Gujarat is 21.37. When one examines the representation of SCs and STs in Teacher Education which is 16.80, against their representation in the total population which is 21.37, it may be considered to be quite satisfactory. The comparative enrolment of SCs and STs over the four years is presented in Figure 1.

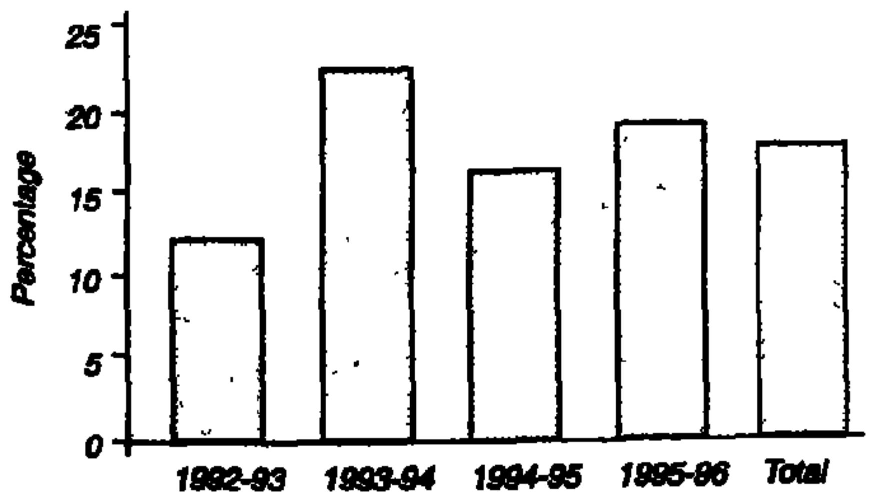

Figure 1 : Enrolment of SC and ST students in Teacher Education over the four year period 1992-93/1995-96

In brief it can be said, that satisfactory progress has been made by the SCs and STs in the field of Teacher Education.

Wastage and Stagnation in Teacher Education

In order to achieve one of the important social objectives of education, that is, to provide equal opportunity, enabling under privileged classes and individuals to use education as a lever for the improvement of their conditions, reservations are provided for SCs and STs in professional courses. From the enrolment figures in the previous section one can know that SC and ST students are admitted to the teacher education institutions. But, after getting admission, do all of them get the real benefit of this opportunity is a question of great concern. For this purpose, wastage and stagnation was studied in the teacher education institution.

In order to study wastage and stagnation, that is, the rate of dropouts in teacher education institution, past four years data were collected from the Faculty of Education and Psychology for B.Ed. Course. Year-wise data are presented in Table 2 for SC and ST students.

S. No.	*Year*	*No. of SC & ST Students Admitted*	*Number of Dropout*		*Total*	*Percentage*
			SC	*ST*		
1	1992-93	23	00	02	02	08.70
2	1993-94	42	03	02	05	11.90
3	1994-95	29	03	01	04	13.79
4	1995-96	34	00	02	02	05.88
	Total	128	06	07	13	10.16

Table 2 : Rate of Dropout of SC and ST Students in the Faculty of Education and Psychology

It can be observed from Table 2, that the dropout rate in the teacher education institution is 10.16 per cent. It is also worth mentioning that, in case of SC students the dropout was only in the case of boys and not in girls. The results also indicate that in case of ST students also the dropout rate was much lower in the case of girl students when compared to boys. In fact out of total dropouts, 71.73 per cent were boys and 28.57 per cent were girls. Figure 2, represents the rate of dropout of the students.

In order to study the stagnation of students in the Faculty of Education and Psychology, the rate of failure in B.Ed. Course was studied.

Rate of Failure of SC and ST Students in the B.Ed. Course

It would also be worthwhile to discover the position of SC and ST students during their course of studies. Examination results are the best indicator for studying the academic position.

It may be mentioned here, that, in any course of study it is not only admission which can indicate the progress, but, it is student's work, understanding of

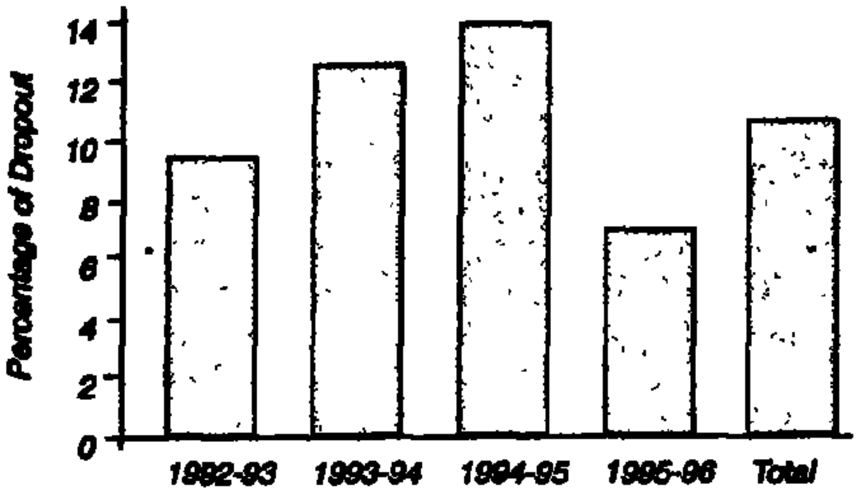

Figure 2 : Rate of dropout of SC and ST students over the four year period 1992-93/1995-96

instruction in the institution and successful completion of the course within stipulated time, which is also the mark of progress. All these aspects are represented in the examination results. It was for this purpose, that, the results of SC and ST students of the Faculty of Education and Psychology were obtained and rate of failure calculated for four years. The analyzed results are presented in Table 3.

S. No.	Year	No. of SC & ST Students Admitted	Number of Failures SC	Number of Failures ST	Total	Percentage
1	1992-93	23	06	07	13	56.52
2	1993-94	42	05	01	06	14.29
3	1994-95	29	02	03	05	17.24
4	1995-96	34	01	11	12	35.29
	Total	128	14	22	36	28.13

Table 3 : Rate of Failure of SC students in the Faculty of Education and Psychology

From Table 3, it can be observed, that, a large number of students fail in case of SC and ST students. It can also be observed, that, rate of failure is higher in case STs (32.35 per cent) when compared to SCs (23.30 per cent). This rate of failure is certainly high. The results of this study also reveal an interesting trend in the rate of failure, that is, the rate of failure has decreased sharply after 1992-93. The results also indicate that the rate of failure though decreased is comparatively higher again in the year 1995-96. This trend is shown in Figure 3.

As revealed by the results, that, a very large number of students fail from SCs and STs in Teacher Education, it may be creating lot of strain to the students. Moreover, this deteriorates their progress and demotivates them. Therefore, it is necessary to organise instructional activities in such a way that the requirements of SC and ST students are met. This necessitates, that, one should know the real problems faced by them during the course of study so that, these problems could be solved and students' learning could be enhanced. It was for this reason, that, the problems of SC and ST students were also studied.

Problems of SC and ST Students

In order to study the problems of SC and ST students, 26 students who were studying during the academic year 1996-97 were personally administered a questionnaire developed for this purpose. They were also interviewed to know their real problems, particularly those which they could hesitate in writing. These problems are divided into three categories, viz, problems related to accommodation and physical facilities, academic problems and financial problems.

Problems Related to Accommodation and Physical Facilities

The students were asked to indicate, if they had any problems related to stay, distance of their residence from the Faculty, disturbance in studies at their residence, whether they had facilities like place for study, a table and a chair, a fan, a cot, toilet and bathroom facility. It was revealed by the study, that though most of the SC and ST students of the Faculty of Education and Psychology did not face any problem related to accommodation and physical facilities, some students did faced problems. About 46 per cent students faced problems related to accommodation. Out of 26 students of SC and ST, 09 were staying about 07 to 15 km away from their place of study, whereas, two students travelled a long distance daily to attend their classes. One of them was staying 60 km away from the Faculty and the other was staying 95 km away. These students devoted more time in coming and going and also felt tired due to daily travel. Out of 26 students, 06 stated that they had disturbance in their studies at their residence.

The main reasons given for disturbance were as follows : (i) The house is on the road and vehicles disturbance is too much; (ii) There is only one room in the house and it is difficult to concentrate on studies due to other members of the family; (iii) Distur-

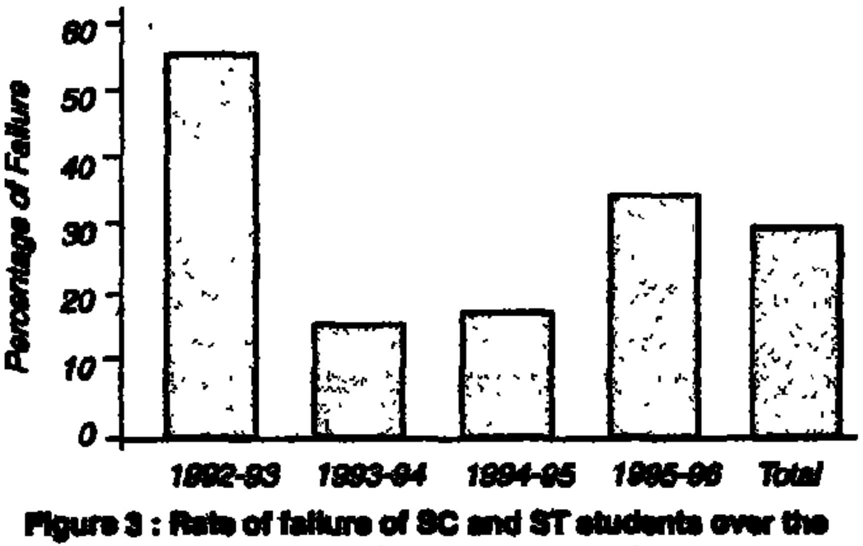

Figure 3 : Rate of failure of SC and ST students over the four year period 1992-93/1995-96

bance around the house due to loud voices, many times neighbours keep television, radio at very high volume, sometimes there are quarrels too; and (iv) Children keep on playing cricket and other games in front of the house whole day which disturbs in studies.

With respect to physical facilities it was found that out of 26 students of SC and ST, 09 did not have a separate place for study, 05 did not have a table and a chair, 03 did not have a cot, 01 did not have a fan and 01 did not have toilet facility.

It may be pointed out that these problems adversely affect the studies and academic performance of SC and ST students.

Academic Problems

Regarding the academic problems students were asked whether they understood instruction in the classroom. The results revealed that a large number of students faced problem in understanding instruction in the classroom because of the following reasons : (1) Majority of students, about 7.24 per cent, did not follow instruction due to language problem; (2) Some students, about 22.98 per cent, stated teachers' teaching method as reason for not understanding the instruction. They indicated that, sometimes teacher's communication was not clear, some teachers were too fast.that their speed came in the way of understanding classroom instruction.

About 4.59 per cent stated certain other reasons such as : i) Our admissions got delayed and it was difficult to cope up with other students whose classes had already started; ii) Lack of sympathetic attitude on the part of teachers; and iii) Lack of confidence and a fear that we may not understand the instruction of very high level.

Regarding academic problems it may be stated here, that, the results of this study are supported by another study conducted by Sahasrabuddhe (1995), where similar problems were reported.

When they were asked, "How do you solve your academic problems?" majority of them 64.60 per cent stated, that, they took help of their friends, 20.30 per cent indicated that they took help of their teachers and remaining got help from their parents.

These students were also asked, "How your academic problems be solved in your opinion?" The students suggested the following as per their requirements : (1) Teachers may not speak very fast during lecture; (2) For SC and ST students some classes for English improvement may be arranged; (3) Instructional material or lecture notes may be provided to the students; (4) Main points and difficult points, may be explained to SC and ST students at the end of the lecture; (5) In between, occasionally, particularly for difficult and new concepts Hindi or Gujarati language may be used; (6) Teachers may have sympathetic attitude towards students and encourage them; and (7) Some orientation programme could be conducted for SC and ST students in the beginning before starting the regular classes.

Financial Problems

With respect to financial problems, the results of this investigation indicate, that, though majority of SC and ST students did not face any problem in purchasing adequate number of books, managing break fast, tea etc. and paying fees, some students faced problems. About 28.21 per cent students stated, that, they could not purchase required number of books due to shortage of money. About 13.79 per cent students avoided taking breakfast and tea due to financial problems. They managed on two meals a day. About 17.65 per cent stated, that, they faced problem in paying their fees and food bills.

When they were asked, "How do you solve your financial problems?" Majority of them, stated that their parents borrowed money for their studies. Some indicated that they themselves borrowed from their friends.

Conclusion

With respect to the problems of SC and ST students in brief it can be stated, that, they the majority of them did not face problems so far accommodation and physical facilities, and finances were concerned in the M.S. University of Baroda. Main problems they faced were academic where institutional help was needed for arranging extra coaching for SC and ST students by the staff along with some intelligent students of the same class. This would make the SCs and STs make progress in Teacher Education as also ensure equal opportunity to weaker sections in real sense.

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86th Indian Science Congress A Report

Invoking national pride while simultaneously underscoring the need for global collaboration, the Prime Minister, Mr. A.B. Vajpayee, called upon the scientific community to be prepared to "deliver the goods" if any country tried to "arm-twist us and deny us the opportunities of legitimate scientific cooperation." He was inaugurating the 86th annual session of the Indian Science Congress Association in Chennai recently.

For more than three decades, India had figured on the technology control radar screens of advanced nations. But, attempts of technology denial had not been without benefits as they had spurred scientists to further strengthen national capability. "This has reinforced our belief in the maxim that strength respects strength," he said.

In this context, he mentioned the "achievements" of nuclear scientists at Pokhran which had "filled the entire Indian scientific community with self-confidence".

However, in today's world of inter-dependence, and at a time when research and development had become a very costly activity, "our scientific community must forge the closest possible collaborations with the best institutions across the globe", he said. The scientific establishment must focus on quality which stood international scrutiny, he added.

The Prime Minister identified meeting the needs of industry, agriculture and services as another problem-solving area for scientists. "Food security, water management, energy and material conservation, low-cost housing, environment protection, maximising our exports by achieving cost and quality competitiveness in world markets, high-quality technical education leading to self-employment opportunities, all these are crucial for our national development," he said. Also, universities and R and D institutions must be freed from bureaucratisation for creating world class scientific research.

In the future, science would have to strive for a new integration of knowledge systems that combined reasoning, ethics, individual behaviour, social relations and the environment. "The world will have to move towards harmonisation of science and spiritualism in order to attain peace, prosperity, and happiness for all," he said.

The effects of science and technology had been both positive and negative : scientists and non-scientists must be concerned about minimising the negative effects and maximising the benefits for the greatest good of the greatest number of people, he said.

While calling for special measures to support women scientists, Mr. Vajpayee urged the Ministry of Human Resource Development to give high priority to the simplification of rules and regulations and encourage more women professionals to get involved in scientific programmes.

The Prime Minister gave away the annual scientific awards, including the Jawaharlal Nehru birth centenary award to the Union Human Resource Development Minister, Dr. Murli Manohar Joshi, and the Shatabdi Puraskar awards to eminent scientists such as Prof. M.S. Swaminathan, Prof. V. Ramalingaswamy and Prof. M.G.K. Menon.

Among the distinguished foreign scientists honoured on the occasion were the Nobel laureate, Dr. James Watson, and the editor of the magazine *Nature*, Dr. Philip Campbell.

The Governor, Ms. Fathima Beevi, who felicitated the organisers, winners of various scientific awards and the Anna University, said the Congress was one of the avenues of information and knowledge where "we receive a number of eminent scientists from the world over". She hoped that the bio-sciences theme would bring out strategies to harness these areas for the welfare of humankind.

The Union Minister for Human Resource Development, Dr. Murli Manohar Joshi, said that scientific institutions would take up 21 important development projects as part of the Jai Vigyan National Mission with focus on science and technology.

These projects would be in areas such as food security, energy conservation, health care, disaster management and bio-diversity. Scientific and R and D institutions would take up one project in 1999.

All the projects would be given green channel treatment with procedures relaxed, he said.

The Minister said he had directed the Department of Bio-technology to institute 10 awards every year for outstanding young scientists in biosciences.

This would encourage high-quality research of excellence and relevance, he said.

As achieving excellence was dependent on innovative talents, which in turn needed identification and nurturing from an early age, a new scheme to select under-

18 youngsters of outstanding talent and to provide them with necessary ambience and opportunities for harnessing their talent had been instituted. These youngsters would be supported with substantial scholarship for education in science.

An information technology Action Plan had been formulated envisaging "IT for All" within a period of 10 years.

The Department of Space was taking initiatives to set up space museums and space parks in different parts of the country to arouse the curiosity of youngsters in the area of space science and technology.

Large space museums in metropolitan cities would have full scale models of Indian satellites and launch vehicles, interactive space exhibits, space theatres, etc. in smaller cities, there would be medium class space centres, he said.

Speaking on the occasion, the Tamil Nadu Chief Minister Mr. M. Karunanidhi said the Tamil Nadu Government had initiated efforts to establish the infrastructure for its proposed "Science City," including a world-class convention centre for conferences and exhibitions, a techno-incubator park, a children's hands-on science park, and a science and technology information network. He said the activities were planned with support from scientific, research and industrial institutions in Chennai, which were involved in organising the Congress.

Steps have been taken to establish a "Ramanujan Museum" — in the name of the mathematics wizard of Chennai, jointly by the University of Madras and the Institute of Mathematical Sciences, Chennai.

Mr. Karunanidhi appealed to the Prime Minister to consider "making the museum into a national asset".

Pointing to the theme of the Congress, "new bio sciences — opportunities and challenges as we move into the next millennium," Mr. Karunanidhi said biotechnology and information technology had taken strong roots in the country, especially in Tamil Nadu. Tamil Nadu was in the forefront in implementing new biological alternatives to pesticides and fertilisers.

While emphasising the State's thrust on biosciences, he said the establishment of the Golden Jubilee biotechnology park for women was an example of this. Tamil Nadu, he said, was well known for its infrastructure for professional education, which would be most helpful for establishing knowledge in hi-tech and industrial development and keep pace with global phenomena. It also had to its credit, distinguished scientists and technocrats, such as Ramanujan, G.N. Ramachandran, A. Ramachandran, Nayudamma, C.V. Raman, K.S. Krishnan, S. Chandrasekar, Verghese Kurien, Abdul Kalam and many others.

Time was when the common man knew little about science, but now people even in remote villages were quite aware of not only recent happenings such as computer and Internet, but also Pokhran and the atom bomb.

Turning to the other sunrise sector of the economy, information technology, Mr. Karunanidhi said Tamil Nadu had actively taken up the development of Internet connectivity to reach the rural population. The educational programmes introduced through the TANITEC (Institute of Information Technology) and the TIDEL Park, organised by TIDCO bore testimony to the State's commitment, he added after handing over a souvenir brought out for the occasion to the Prime Minister.

Dr. Manju Sharma, general president, Indian Science Congress Association, called for efforts to ensure that the abundant biological resources were "not frittered away". Sustainable development commensurate with the planet's carrying capacity would call for new approaches at moral, ethical and societal levels. Modern bioscience could help in using available resources to meet the people's growing needs in harmony with nature, and provide quality food, nutrition, low cost and affordable health care and gainful employment for all.

Agriculture and Allied Areas

A novel gene which confers salt tolerance on plants has been found by scientists at the International Centre for Genetic Engineering and Biotechnology (ICGEB) at Delhi. This gene had been isolated by scientists in this country from the plant *Brassica juncea*, pointed out Dr. S.K. Sopory of the ICGEB during the first plenary session on "Agriculture and Allied Areas." Such a gene when introduced in other plants could potentially allow them to be grown in saline soils.

The gene had been successfully put into tobacco plants with promising results. It had also been introduced into rice, but the results were not yet available, added Dr. Sopory. The gene also let plants tolerate high levels of zinc in the soil.

A calcium binding protein gene had been isolated from entamoeba, according to Dr. Sopory. If this gene was introduced into plants in what was known as its "antisense" form, it increased the levels of chlorophyll, the green matter in plants which converted sunlight into energy stored in foods. The reason for the increased chlorophyll was not yet fully clear, he added.

In a world where population growth was outstripping food supply, agricultural biotechnology needed to be swiftly implemented, according to Dr. Arie Altman from Israel.

While world population was expected to reach 10 billion in just 50 years' time, agricultural production was growing at 1.8 per cent year, pointed out Dr. Altman. Food supply had to grow in the face of reduced land and water availability as well as deteriorating soil, water and air quality.

Traditional agricultural methods faced serious limitations in meeting this challenge. Release of new improved varieties by classical breeding methods was too slow and modern bio-technology provided tools for better and much faster breeding techniques. Although most money in biotechnology was currently being invested in medicine, it was agriculture which required greater investments as many more people died from starvation and malnutrition than from disease.

Developing plants tolerant to drought and salinity would become increasingly important. A gene isolated from the poplar plant was found to make a protein which provided some degree of drought resistance to plants into which this gene was transferred. It was interesting that a similar protein had been found in fishes living in the icy waters of the Antartic.

A cholera gene had been transferred to the potato which when fed to mice was found to make them immune to the disease, Dr. Altman said.

The "new biology" made it possible to overcome limitations of conventional breeding methods, pointed out Dr. V.L. Chopra, former Director-General of the Indian Council of Agricultural Research. The new methods had "demolished barriers to gene transfer", and genes which carried desired traits could now be transferred from unrelated organisms.

Instead of using insecticides which killed useful insects and also entered the food chain, plants could be made resistant to pests and even viral infections.

By changing chemical pathways inside a plant, an oil plant could be made to produce a different kind of oil. It was possible to prevent coffee plants from synthesising caffeine. The result would be coffee with the full flavour of good coffee but without the caffeine. Currently, about 20 per cent of the coffee in the world was being decaffeinated by industrial methods, he pointed out.

Isolating suitable genes and having them in test-tubes was not enough, pointed out Dr. Chopra. The involvement of professional breeders was vital, he added.

Dr. Akhilesh Tyagi spoke on "regulation biology and biotechnology for crop improvement with special reference to rice"; Dr. Sushil Kumar on "rotations of food, medicinal and industrial crops for higher productivity"; and Dr. M.L. Madan on "livestock production — opportunities and challenges".

Advances in modern biology, such as cloning and transgenics, has raised issues and concerns which needed to be debated by the public, according to Sir Richard Sykes, Chairman of the Glaxo Welcome group and also President of the British Association for Advancement of Science.

In order that such a debate resulted in wise choices, rather than ones made from fear and hysteria, it was important that the debate be an informed one and also that public concerns be heard, said Sir Sykes when he spoke on "third generation pharmaceutical research and development" at the first plenary session of the Indian Science Congress.

Scientists should explain scientific advances and their implications to the public and they should also be prepared to listen to the concerns which the public had, he said.

A strong intellectual property rights regime was needed to get the full potential from the exciting new advances being made in drug discovery, he said.

The human genome project, which sought to sequence all the estimated 1,00,000 genes, would make it possible to identify genes associated with various diseases.

Identification of such genes would permit underlying mechanisms to be understood and to find new targets for more effective drugs. Genetic tests would make it possible to tailor treatment to each individual, maximising efficacy and minimising side-effects.

Study of the genes associated with Alzheimer's disease made it possible to detect early which individuals were more susceptible to it and therefore to take action to delay its onset.

It would become possible to say which individuals would be predisposed to asthma and to which type of asthma, said Sir Sykes.

The number of targets was likely to increase five to ten fold in the next few years. These targets were more complicated, and large chemical libraries were needed to develop leads for new drugs.

Using automated combinatorial chemistry equipment, a single scientist could generate millions of such combinations in a year. Robotics already made it possible to screen half a million such combinations per week for basic potency and soon it would be possible to screen one million in a day.

Novel vaccines and new diagnostic methods were becoming available. The new techniques were making possible medicines of real therapeutic value.

Sir Sykes believed that it would become possible to cure or at least substantially alleviate common serious diseases.

Even 10 years ago, quality was the aim of the drug industry. Last few years, the emphasis had shifted to cost. Now tightening government budgets demanded quality at a fair price, he said.

Genome Summit

Nobel laureate Prof. James Watson called for a law to protect the gene privacy of the society while stressing the need for the governments to stay clear of genome research.

Addressing the Genome Summit of the Indian Science Congress in Chennai, Prof. Watson, who had won the Nobel Prize for his discovery of the Double Helix Structure of the DNA (Deoxyribo Nucleic Acid) in 1953, said : "The governments cannot decide what sort of babies its citizens must have. What sort of a child a woman wants to have is her personal decision."

In fact, the public fear over genome research stemmed from the apprehension that governments might end up deciding what sort of babies their citizens must bear, besides peeping into the DNAs of individuals, Prof. Watson said.

Cautioning the governments against resorting to both those unethical practices, the DNA scientist declared : "If it is done, it will be the recipe for disaster." However, it was also true that some of those who opposed genome research lacked enough knowledge to base their judgement. People chose to be unpleasant without the knowledge of genetics, he said.

He said the true danger was not the awarenes that someone carried a gene with a predisposition for breast cancer or some other disease, but the danger really lay in the breast cancer itself. A solution thus lay in finding a cure for the disease and in that, gene therapy could provide valuable clues.

Drawing examples from the recent past in the US and Germany, where discriminatory practices were in vogue even without any genetic research to back them, Prof. Watson sought enactment of laws to prevent recurrence of such aberrations. With the advent of geneticist Mendel, modern genetics had taken off but scientifically unfounded gene theories espoused by the early USA and the Nazi Germany led to "bad or negative eugenics".

The US enacted immigration laws based on the belief that those who could not speak English had bad genes. It was also proposed to sterilise parents with mentally retarded children. It was even worse in Nazi Germany where the ruler pursued a programme of racial purity in 1930 and four years later, resorted to compulsory sterilisation of those with hereditary defects. The mentally ill were summarily executed, Prof. Watson recalled. He called for the privacy and fair use of genetic information, ethical principles in human genetic research and clinical integration of gene technology.

DNA Fingerprinting

The technique of DNA fingerprinting is applied not just to catch criminals and settle paternity disputes. The Centre for Cellular and Molecular Biology (CCMB) at Hyderabad, which pioneered this technique in India, has developed methods which will permit easy DNA fingerprinting of wild animals. As a result, this hi-tech tool can be used in well-targeted breeding programmes to prevent endangered animals from becoming extinct. This was revealed by Dr. Lalji Singh, Director of the Centre in his talk delivered at the Science Congress. According to him, the Centre has found a way of extracting DNA required for such fingerprinting from an animal's excreta which contains also a few cells from its alimentary canal. As a result, blood or tissue samples, which require a wild animal to be caught and anaesthetised, are no longer needed for DNA fingerprinting.

The CCMB is joining hands with the Nehru Zoological Park at Hyderabad and the Forest Department of Andhra Pradesh to establish a Centre for Preservation of Endangered Species. The Department of Biotechnology has sanctioned Rs. 2.6 crores for the project and the Central Zoo Authority was providing Rs. two crores, said Dr. Singh.

DNA fingerprinting would be used to avoid breeding from closely-related animals. Inbreeding reduces genetic variability and increases the animals' susceptibility to disease. The centre would have a sperm bank, facilities for *in-vitro* fertilization and selective breeding.

The CCMB scientists have used DNA fingerprinting to show that contrary to earlier claims by U.S. scientists, the Asian lion found only in the Gir forest and the Bengal tiger did not suffer from such lack of genetic variability, through inbreeding, that there was increased risk of these endangered animals becoming extinct.

The American scientists had drawn their conclusion from an analysis of the animals' serum proteins. Using a DNA fingerprinting technique called Random Amplified Polymorphism, the new study showed there was 30-36 per cent genetic variability in these animals. Microsatellite analysis, which looks for small repeat sequences in the genetic code, and analysis of mitochondrial DNA also showed considerable variation in the genetic makeup of the animals. Study of one of the key genes involved in immune response indicated that its variation in these animals was as much as in outbred animals.

He believed the relatively lower genetic variability found in the Asian lion and Bengal tiger was not due to inbreeding but was an inherent characteristic of these animals. DNA fingerprinting of cells from animal hides of over 150 years old showed that the genetic variability was not significantly greater then.

High Altitude Care

Two important breakthroughs, which would help Indian troops at high altitude and mountaineers suffering from pulmonary oedema, were announced at the Indian Science Congress by the Director, Defence Institute of Physiology and Allied Sciences (DIPAS), Dr W. Selvamurthy.

Disclosing the results of their findings, Dr. W. Selvamurthy said the breakthrough for the prevention of high altitude pulmonary oedema caused by the collection of water in the lungs, which acted as a barrier to the diffusion of oxygen from the lungs to the blood vessels, had been accomplished by the use of nitric oxide (15 parts per million) in combination with oxygen (50 per cent). It reduces the pulmonary artery pressure by acting on the potassium ion channels.

With about six to eight hours of administration, the radiological clearance of lungs has been noticed. There are no toxic effects of this administration and more than 48 patients have been treated so far successfully using this new treatment modality.

This was a joint study done by the Defence Institute of Physiology and Allied Sciences and High Altitude Mountain Research Centre and the University of Minnesota, USA. The study was done at Leh situation at an altitude of 12,000 feet.

Dr. Selvamurthy said that the then Director General Armed Forces had accepted introduction of the new protocol of treatment for soldiers suffering from this malady.

Though pulmonary oedema prevalence was only 0.2 per cent, but looking at the number of people going to the mountains it was large. Anyone with pulmonary oedema has to be evacuated to lower altitude and given oxygen.

Indian armed forces were perhaps unique in the world, being deployed at height of 20,000 feet, "nowhere else in the world are troops deployed at that height." Some soldiers develop pulmonary oedema and have to be evacuated at present.

The present finding would result in the soldiers being treated there itself and would not need evacuation.

It would improve the health and operational efficiency of troops posted at places where there is extreme cold and in high altitude regions, he added.

This finding will also benefit the mountaineers as well as trekkers and skiers and others indulging in adventure sports, besides clinical hypoxia affected patients and also patients with respiratory distress, carbon monoxide poisoning and head injury induced pulmonary oedema, he said.

Efforts are on to indigenously synthesise pure nitric oxide so that it can be available in a cost effective manner. The precaution to be observed is to ensure the purity of nitric oxide and guard against its contamination by nitrogen dioxide.

The other breakthrough by DIPAS was for cold injuries which was a major problem in cold regions, including high altitude, polar environment and in temperate countries, Dr. Selvamurthy said.

In this, the blood vessels constrict due to cold leading to reduced blood supply to the body areas exposed to cold without protective clothing, he said.

Cold leads to the formation of "micro clots" due to stagnation of circulation. Ultimately the tissue will be frozen leading to disintegration and death of the tissues which could result in "fingers falling off". Often, the formation of infectious gangrene leads to amputation.

So far 80 patients have been treated with this new modality. One of the encouraging thing about this treatment was that while the conventional way led to a greater amount of amputation, this minimises the area of amputation.

Inter-Ministerial Task Force

A new policy initiative for Science and Technology development in our country is needed as we enter the next millennium, said Prof. S. Ramamurthy, Secretary of the Department of Science and Technology, while presenting a report on the inter-Ministerial task force. The report is based on a list of recommendations arrived at the last year's congress held at Hyderabad.

The list included steps to find out ways to boost the flow of funds for scientific research, fillip to technology development, augmenting trained manpower, rejuvenating educational institutions, assisting the States in S&T application, and making scientific data/results easily accessible by the public without jeopardising national security.

The need to tap more funds for research continues to be the uppermost priority. As of now, the investments amount to about 0.7 per cent of the GNP, which is very low, compared to the figure of 2.5-3 per cent in some of the Western countries. Therefore, the first step would be to spell out measures that can boost the investments to at least two per cent.

According to Prof. Ramamurthy, the tax concessions and duty exemptions given by the Government during the last few years did not lead to flow of funds as expected. Only a few small medium industries benefited and the big money is yet to come.

Big companies would begin to fund indigenous research only if they see a return, he said. For this, we need some success stories, he said. One such is the Technology Development Board. The Board has garnered about Rs. 180 crores during the last two and half years of which two-thirds is from the industries. This, according to him, is significant because during the period the industry was at a low level.

So far, the Board has also supported about 35 research projects and the results of 10 of them have already been commercialised, he said.

Another point mentioned in the report is the fillip to be given to development of technologies relevant to India. Large-scale investments have been made in the defence research, space research and atomic energy and the results are visible.

The methodologies applied in these departments for technology development and those used in Technology Missions, apart from significant allocation to chosen projects, have to be extended to non-strategic fields of considerable economic significance such as areas of power, transportation and communication.

Augmenting trained manpower is another point of concern. In the face of flight of technical manpower to software, management and to other countries, it is essential to think afresh for ensuring availability of trained manpower.

For this purpose, the task force has recommended that the concept of assured placement, presently working well in the DAE, be extended to other fields such as communication and petroleum, where considerable investments are foreseen. It has also recommended a few suggestions for rejuvenating educational institutions, 'encouraging young scientists and assisting the States in science and technology applications.

Women in Science

Are women scientists being discriminated against because their brains are different? asked Dr. Ken Lukowiak, Professor in the Department of Physiology and Biophysics, University of Calgary, Canada. He said, "The male-dominated scientific world does not appreciate the different make-up of the female brain and therefore women scientists are subtly discriminated against."

While women's brain was holistic and intuitive, man's was more analytical and reductionist, going into smallest details. Man not having broad holistic and intuitive outlook of females, which is also a necessary component of the scientific outlook, at times does not see "the forest for the trees".

Right now men being in charge in the scientific world, the outlook of women is not appreciated as it was different.

Anything different is undervalued and women scientists are not seen as "valuable assets," he added. "We are putting road blocks in front of women. We must see that we do not push women out of science."

Dr. Leukowiak, who spoke on "Comparative Physiology of male versus female as to who is in charge", said as a general rule female scientists had higher IQ than male scientists but then "why aren't there many women in the field of science", he asked.

Since 1901 only six women have got the Nobel Prize. In Europe 94 per cent of full professors are males. He said according to a Canadian study, even though the number of women was more than men at the undergraduate level and almost same at the Ph.D. level, when it came to finishing Ph.D. only a third were doing so.

He said this was due to subtle discrimination which even showed in the form of lack of role model as scientist or doctor was always pictured even in advertisement as a man with a white lab coat talking to another male. This in effect hinted that women were not wanted in science.

Women and men having basic phsiological differences in their brains would view the same data presented to both differently.

Males have more neurons than females in their cortex. However, females have estogeneric centres which have a protective effect, therefore, less males than females get Alzheimer's disease than females. Differences in the brain affects the total personality.

Education and Scientific Progress

The educational system needed to be changed so that people would be able to cope with the rapid pace of scientific progress, according to Dr. Bruce Alberts, President of the U.S. National Academy of Sciences.

Science should not be seen as an arcane profession practised by an elite priesthood. Rather, people should feel comfortable with science as it had direct and growing impact on their jobs and lives, he pointed out at a talk during the Indian Science Congress.

The educational system should be changed so that it could prepare new generations of people with a much broader way of dealing with complex information, he said. Although Dr. Alberts made it clear that he knew only about the American system, his observations were likely to be no less relevant to the Indian situation.

Science should be taught as a core subject in schools, right from kindergarten. This could take 10 or 20 years to accomplish in the United States and would require scientists to behave differently in many ways. "As president of the National Academy of Sciences, my mission basically is to try to talk to scientists about their new responsibilities," said Dr. Alberts.

For one thing, people who studied science in college and university should be encouraged to become science teachers in schools. "If we don't have people who understand science teaching, there is no way we can change the nature of our education system," he said.

Scientists must have direct contact with teachers in schools so that they could be colleagues and allies. Being a school teacher was a very isolated position and scientists should suport them with resources and intellectual and moral support. School teachers should have access to the resources of the scientific community. Without access to these resources, as well as the opportunity to interact with scientists and be supported by the latter, a good school teacher would find it impossible to keep pace with scientific developments.

Consequently, scientists had to take a much broader view of their role. Their task was not only to prepare the next generation scientists. Scientists also needed to pay explicit attention to preparing the next generation of science teachers and then supporting them.

The support of the scientific community was also needed in developing the curriculum. Science was about learning by struggling with a problem, not reading about it. "We try to cover way too much material in too short a time." So all the students really did was memorise a bunch of facts. As a result, most people came to dislike science. Even those who did well in the course did not know what science was really about. None of these people had really been prepared for the rest of their lives when they would need to learn new information and appreciate how science was advancing.

Science education should equip people with a basic set of thinking skills. They should be able to distinguish between good and fake science. People should be able to know what sort of information could be relied on and which was not credible.

The examination system, which lay at the heart of many problems in science teaching, needed to be changed. "The wrong kind of examination drives the wrong kind of teaching and this is a problem in the United States." Teachers were forced to teach science in a way which prepared students for the examinations. A good teacher did not get a chance to teach in a way which fostered understanding, remarked Dr. Alberts.

Public Awareness of Science

There was a need to create awareness amongst the public about the significant developments happening in science, said Dr. Philip Campell, editor of the international science magazine, *Nature*, in his lecture delivered at the 86th session of the Congress.

He was trying to differentiate between public interest in science and science awareness and to tell the scientists to prepare their society to keep pace with the rapid developments in science and technology. This is true considering the new advances in cloning, plant engineering, genetherapy, atomic power and the like.

Worldwide, there is an enormous public fascination with science. Quoting the results of replies received to a question "Who out of all men and women who have lived in the last 100 years would you like to celebrate above all?" posed to the British audience some time back by a BBC radio programme, he said, Shakespeare was the top choice. Amongst the top 10, which included politicians, were two scientists: Darwin and Newton who transformed science and our life. Such is the interest of the public in matters related to science. The growing number of science publications and magazines around the world also directly manifests the interest, he said. However, they don't speak about the public understanding of science. He hastened to add that we should not be too hung up about the lack of public understanding at any one point of time, as it will inevitably grow over the years.

But public awareness is something else, he said. There is a need, for bio-technologists especially, to communicate more effectively with the public as the impact of their work is very much related to our lives. The same holds good for other branches of science also.

Another surprising fact is that reports on human health, astronomy and biotechnology hog the limelight most of the time. It is hard to write about developments in physics and chemistry. He also called upon the physicists and chemists to communicate with the masses more effectively so that they understand the advances being made.

Pointing out the challenges and opportunities for the scientists in taking science to the masses, he said, the scientists should make society keep up with science; involve the public and also consult with them in matters relating to the impact of science; prepare them for the unexpected results such as the Dolly; reverse the widening of the information gap between different parts of the world; and despite the voluminous coverage of science in the media, how can we do better?

He also dismissed the threat that the Internet may pose to print media because of the time taken to download graphics due to limitation of technology. This is in spite of the Internet proving to be very valuable to tap and refer to information available worldwide.

Another gap in Western coverage at least concerns the conflict between the good intentions behind new technologies and local tradition. But coming back to life sciences, he said, one important gap relates to foresight and feelings : anticipating developments, examining the potential impacts and also the ethical and social consequences. The cloning of mammals from adults as in Dolly sheep was anticipated in an article in *Nature* a year ahead of that work. Few anticipated that subsequent progress would be made so rapidly. Furthermore, even fewer, anticipated that such experiments would create such a sudden surge of alarm over the prospect of human cloning. It would be arguing too much from hindsight, he said.

Commenting on issues facing gene therapy and genetic modification of plants, he said, national bio-ethics committees are an important component in the consideration of such problems. However, some of them are poor at consulting or involving the public and their activities do not stimulate much media exposure or public awareness. More resources are needed as is more imagination and effort in their communication with the media, he said.

Towards the Future

The 86th session of the Indian Science Congress ended with a resolve to initiate major projects in the fields of agriculture and human medicine, with a view to making biosciences mass-based.

Pointing to the near seamless flow of bio-sciences research from laboratory to the field, the general president of the Congress and Secretary, Department of Biotechnology (DBT), Dr. Manju Sharma, said participants and decision makers in Indian science had agreed to provide a major thrust to human resource and R and D activities in biosciences, with active support from the DBT.

"We plan to identify 10 agriculture universities, which will monitor and involve in location-specific research projects for genetic enhancement and genetic improvement using molecular biology and other modern techniques. The idea is to provide the farmers and clusters of villages with small but well-equipped laboratories for improving agricultural practice such as use of bio-pesticides or bio-fertilisers," Dr. Manju Sharma added. The project would also be able to equip the agricultural universities with modern biology tools.

In the area of medicine, the thrust would be to provide some of medical colleges/universities with centres that could work in areas such as neuroscience, molecular biology and genetic counselling.

The Congress stressed the need to take up a time-bound programme to identify, inventorise and document all data regarding the country's enormous botanical and zoological biodiversity. The Botanical and Zoological Survey of India were already performing this task, but this would be given a push. Also, Dr. Manju Sharma said, centres for mapping the microbial diversity of the country had to be created. She hoped the entire work would be done within a three-year timeframe.

A forum on women and science held at the Congress highlighted the need for State governments' support to expand the biotechnology-based programme initiated for empowering village women, SC/STs, children and other marginalised sections. Biotechnology itself had a very small gestation period and these programmes should provide more job opportunities to the as-yet-unreached sections.

Dr. Sharma said the delegates and scientists were unanimous that biosciences held the key for future food and health security of the world. India with its large biodiversity and infrastructure, thus had to accord the highest priority to human resource development to ensure that a proper technology delivery system was developed.

The Tamil Nadu Education Minister, Mr. K. Anbazhagan, gave the valedictory address and presented the 'Young Scientists awards' along with Dr. R.M. Vasagam, Vice Chancellor of Anna University.

Dr. M.S. Swaminathan, agricultural scientist, pointing to the emerging concerns in biosciences, recommended the creation of a National Bank for Women and Development on the lines of NABARD, as a means of channelising microcredit for village women. As a mission, state governments should take up a slogan of 'every child a scientist'.

Prof. M.G.K. Menon, former Union Minister for Science and Technology, who wanted the exhibition held as part of the Congress "to be taken round the country as a mass based programme, urged the Tamil Nadu Government to bring all the scientific institutions in Chennai under a fold so that "it becomes a nucleating point of excellence".

The CSIR Director-General, Dr. R.A. Mashelkar, said the theme of the next Congress to be held in January 2000 at Pune, would be 'Indian Science and Technology into the next millennium". It would strive to create more "knowledge workers" at all levels including in primary farming activity. Producing food for 1.5 billion people with less area for cropping, which would require farmers to use information technology in areas such as using micro-nutrients or long and short-term weather forecasting.

Over 2000 delegates from India and abroad attended the Congress.

NATIONAL INSTITUTE OF NUTRITION
(Indian Council of Medical Research)
Jamai-Osmania P.O., Hyderabad-500 007. (A.P.)

Applications are invited upto 26th February, 1999 for the following posts of Research Officers (Three Posts) in the scale of pay of Rs. 8000-275-13500 at the Council's, National Institute of Nutrition, Hyderabad.

1. RESEARCH OFFICER (Biochemistry) (Unreserved)

Qualification & Experience :

Essential : First Class M.Sc., in Biochemistry/Life Science/Nutrition

Desirable : Three years Research/teaching experience in toxicology. (OR) Ph.D. in Biochemistry.

Job Requirement : The incumbent is required to assist in experiments in the fields of nutritional/food toxicology and allied fields.

2. RESEARCH OFFICER (Neuro-chemistry) (Unreserved)

Qualification & Experience :

Essential : First Class M.Sc., in Biochemistry

Desirable : Three years Research/teaching experience in the area of lipid biochemistry / neurochemistry and publications in reputed journals. (OR) Ph.D. in Biochemistry.

Job Requirement : To undertake laboratory research work in the area of neurochemistry receptor assay, mechanism of food regulation and neuro-toxicity.

3. RESEARCH OFFICER (Statistics) (Unreserved)

Qualification & Experience :

Essential : First Class M.Sc., in Statistics/Mathematics/Operational Research

Desirable : Three years Research/teaching experience in the planning of research studies and statistical analysis, statistics in the field of health & nutrition. (OR) Ph.D. in Statistics.

Requirement of First Class M.Sc., is relaxable in case of candidates possessing Ph.D.

Job Requirement : The candidates should be able to assist the Scientists in designing of experiments planning and carrying out of analysis and data processing on computers.

4. RESEARCH OFFICER (Communication & Journalism) (Unreserved)

Qualification & Experience :

Essential : First Class Master's Degree in Communication & Journalism/Life Sciences.

Desirable : Three years experience in Research/writing of popular health related articles. Proficiency in English/Telugu/Hindi.

Job Requirement : To carry out Information, Education and Communication related research projects.

To assist the division in publication of periodicals and other popular health related publications.

Age : Below 45 years. SC/ST/OBC Candidates are allowed relaxation in accordance with Central Government rules in force. Benefits of Pension available.

Application from employees working in Central/State Govt. Departments/Public Sector undertaking and Govt. funded research agencies must be forwarded through proper channel.

How to apply : The prescribed application form for the above mentioned post can be obtained from Director, National Institute of Nutrition, Hyderabad. The filled in application forms together with attested copies of certificates including caste certificate and testimonials along with a crossed IPO for Rs. 8/- (SC/ST candidates are exempted) drawn in favour of Director, National Institute of Nutrition, Jamai Osmania (P.O.) Hyderabad - 500 007, should be sent so as to reach this office on or before 26th February, 1999. Incomplete applications, and application that are received after the closing date or without IPO will not be entertained.

CAMPUS NEWS

Quality Assurance at MG Varsity

Nearly 30 affiliated colleges and 15 departments under the Mahatma Gandhi University would submit themselves for accreditation of the National Assessment and Accreditation Council (NAAC), set up by the UGC for enhancing the quality of higher education in the country. This decision was taken at the three-day workshop of Heads of the University Departments and the Principals of affiliated colleges. They would submit the Self Study Report to NAAC before March 1999.

The report being prepared by the institutions would be based on the performance in six areas of functioning. These include curriculum aspects; teaching, learning and evaluation; research, consultancy and extension; infrastructure and learning resources and organisation and management. Students, faculty members, staff, alumni, PTA, management and public and all involved in the process.

Head of the Department and two faculty members each from 15 University departments and Principal and 2-3 Senior teachers from 53 major colleges participated in the workshop. It was for the first time in Kerala that such a massive endeavour for quality assurance in higher education was taken up. Dr. K. Gopalan, former Vice-Chancellor, Cochin University of Science and Technology, inaugurated the workshop. Dr. V.N. Rajasekharan Pillai, Vice-Chancellor, Mahatma Gandhi University presided.

Dr. A. Sukumaran Nair, former Vice-Chancellor, Mahatma Gandhi University, in his keynote address on the subject "Higher Education : Retrospect and Prospects" reiterated the need for a review of the nation's performance in the higher education sector. The education system that now prevailed in India was neither value oriented nor knowledge oriented. It was high time to assess the higher education system and adopt appropriate remedial measures to reorient it to attain quality at international standards, he stressed.

Dr. K. Gopalan in his paper, "Quality perspective in higher education" gave a exposition of the evolution of the global higher education system with special reference to that in India. This was the only country where there was no quality assessment in the education sector. Our standards were far below when compared to those in the developed countries. Our achievements were mainly related to the massive number in enrolment in university education rather than in quality perspectives, Dr. Gopalan said.

Dr. Latha Pillai, Deputy Advisor, NAAC presented a paper on "NAAC's process of assessment and accreditation". This was followed by group work on self study. On the concluding day group leaders presented brief reports on their discussion. All the teachers reiterated that the preparation of the self study itself was a chance for introspection and to understand the merits and demerits of all involved in the working of the institution.

Indian Educational Congress

What India needs today is literate people not nuclear bombs, said Dr. Abid Hussain, former Deputy Chairman, Planning Commission. Opening the first Indian Educational Congress in Santiniketan, he said that even after 50 years of independence, India remained one of the most illiterate countries.

"We talk of our ancient culture and wisdom, our saints and sages, but never cared to impart even functional education to the masses," he added.

India had made great strides in industry. It had conquered famines. But despite having good leaders like Nehru, Radhakrishnan and Zakir Husain, it had failed to eradicate illiteracy, he said.

In his keynote address, Professor Amlan Dutta, former Visva Bharati VC, questioned the validity of the present system of education. "We must first determine what kind of society we want, then shape the education policy accordingly", he said.

The frontiers of knowledge were ever expanding. If India had to keep up with the vast technological development, it had to act fast, he said. "But at the same time, the country has to have a reference to local needs and resources in its development of the workforce, he felt.

Visva Bharati's Vice-Chancellor, Dr. Dilip Sinha, in his welcome address, said at present education was heavily subsidised. "The more we can do without government money, the better, because along with the funds come the political strings".

Education had suffered long under bureaucratic bunglings. The NGOs had now a bigger role to play in this sphere, he said.

About 150 delegates attended the deliberations, where the

Chittagong University VC, Dr. Abdul Mannan, was the guest of honour.

Inter-Varsity Debate Competition

To create greater awareness of international affairs among the youth, the Indian Council of World Affairs organised the 13th Indira Gandhi Memorial Inter-University Debate Competition. The prizes were distributed by Ms. Sheila Dikshit, Chief Minister of Delhi. The function was attended by diplomats, academicians.

The topic for this year's Debate Competition in the preliminary round was *Nuclear India is the best guarantee for global disarmament*. In the final round the motion was *Nuclear India is the best hope for world peace.*

Over 100 students and teachers from all over the country participated in the Debate Competition.

While the team of Rajasthan Agricultural University was adjudged the best team and bagged a Running Shield and a cash prize of Rs. 10,000, the team of Nagpur University, was chosen as the Runners-up and was awarded a Running Trophy and a cash prize of Rs. 6,000. The consolation cash prize of Rs. 3,500 was given to the team from Goa University.

For the individual performances, Ms. Vasuda Jaswal of Jammu University, was adjudged the best in Group A and Ms. Jaspreet Kaur Narula of Gujarat University, in Group B. They won a prize of Rs. 1250 each. Ms. Prabodhita Pande of Kumaun University, and Ms. Ruchi Kher of Guru Nanak Dev University, were awarded the second prizes of Rs. 900 each.

The subject chosen each year for this prestigious debate, started way back in 1986, has varied aspects of international issues of current relevance.

Delhi-Soka Varsities Tie Up

Delhi University is reported to have entered into an agreement of academic and educational exchange with Soka University of Japan. The agreement will enable students from Soka University to walk the bridge of friendship and study at Delhi University and vice-versa.

This is the 45th academic exchange agreement realised by Delhi University and will become operative from the academic session beginning 1999. It will allow students and faculties of both universities to visit its partner for a period ranging from three months to a year.

According to the Delhi University Vice-Chancellor, Prof. V.R. Mehta, Soka is a special university because firstly, it has been established by Dr. Daisaku Ikeda, who is a learned man par excellence and secondly, it embodies the great values of mankind.

"The friendship between Delhi University and Soka University will help integrate the humanistic beauty of the former and the determined search for truth of the latter," Prof. Mehta said.

As a philosopher, Dr. Ikeda has provided hope for mankind through his new humanism based on the concept of dharma of King Ashoka implying truth, virtue and justice. He is considered a modern Gandhi by many of his followers.

For Dr. Ikeda's contribution to international understanding, world peace, humanistic education and development of culture, Delhi University has conferred the D.Litt degree (honoris causa) on him. It was presented to Dr. Ikeda in absentia by the Chancellor of the University, Mr. Krishan Kant, the Vice-President, on December 13, 1998.

The honoris causa degree and plaque was conferred on Dr. Daisaku Ikeda, President, SGI, at a grand ceremony at the Makiguchi Memorial Hall on the Soka University Campus at Tokyo by a visiting Delhi University delegation which included besides Prof. Mehta, the pro-Vice-Chancellor, Prof. Abad Ahmad, the Registrar, Prof. K.K. Panda, the Dean of Colleges, Prof. S.S. Rana and the Dean of International Relations, Prof. Neelemegham.

Speaking at the function, Dr. Ikeda said that Delhi University was a place where Mahatma Gandhi stayed on several occasions and interacted with students during the freedom struggle. Encouraged, the students and the faculty contributed enthusiastically towards the struggle.

Dr. Ikeda said the historical legacy of the freedom struggle was embodied in the spirit of Delhi University. In modern society where everything is deadlocked the world should listen to Gandhi's message. It should listen to the spirit or soul of India, he said. "The time has come when the entire world should learn from India's spiritual strength," the SGI president stated.

Prof. Mehta, stated that Dr. Ikeda stood in the great line of Japanese thinkers and educators beginning with Nichiren Daishonin in the 13th Century and coming up to Tsunesaburo Makiguchi in the twentieth.

"Ikeda is one of the greatest leaders of the 20th Century, a great human being, who has been able to concretise the philosophy of King Ashoka's *dharma* and Mahatma Gandhi's *ahimsa* as a strategy of conflict resolution in the modern world," Prof. Mehta said.

"We, in Delhi University, take pride in the fact that Dr. Ikeda is one of the recipients of our degree of doctor of letters. In accepting our honarary degree, Dr. Ikeda has added his luster to this honour, like he has to all those countless others that he has received. This is one of the rare instances where our recipient honours us more than we honour him," Prof. Mehta added.

Academic Libraries & the Internet

The Sixth National Convention on Academic Libraries in the Internet Era will be held during 18-20 February 1999 at Nagpur University, Nagpur. The objectives of the convention are (a) to understand the application of internet in academic libraries; (b) to identify the basic requirements of getting connected to internet and discuss the issues involved; (c) to identify and evaluate the resources available on the Internet to support higher education and research; (d) to understand the tools and techniques involved in designing web pages and use of the web pages for promoting information services; (e) to study the information retrieval mechanisms using the search engines; (f) to evolve a methodology to train the library staff and end-users in making effective use of Internet; and (g) to prepare the academic libraries to absorb this new technology effectively.

The main theme of this Convention is Academic Libraries in the Internet Era. The sub-themes and the topics to be covered under each sub-theme are (i) Academic Libraries and Access to Internet and Intranets — Technological environment for organising internet and intranet services, Impact of internet and intranets on library services, Advantages and limitations of internet and intranet based services, Connectivity options and issues; (ii) Information Sources on the Internet for Higher Education and Research — Science and technology, Social sciences and humanities, Library catalogues, electronic journals, reference sources, etc, Subscription, licensing, access and cost aspects, Selection and evaluation of internet sources, Impact on collection development; (iii) Internet and Web Search Engines — Internet search engines, Web search engines : Alta Vista, Yahoo, etc, Meta search engines, Rating services, Subject-specific search tools; (iv) Developing Library Web Sites — Components of library web sites, Design methods and strategies, Library home page, Content creation strategies and issues, Authoring tools and techniques, Hardware and software aspects, and Case studies.

Further details may be had from Dr. P.S.G. Kumar, Organising Secretary, CALIBER-99, University Librarian, Nagpur University, North Ambazari Road, Nagpur-440 010. Fax : 0712-520420 e-mail : nagpurul@shakti.ncst.ernet.in psgkumar@bom4.vsnl.net.in

Education and Human Rights

Anand Arts College, Anand (Gujarat) organised a three-day University Grants Commission sponsored seminar on "Human Rights Education" for teachers and students on 10th December, 1998, the day on which U.N. General Assembly adopted the Declaration of Human Rights 50 years ago.

Inaugurating the seminar Dr. V.S. Patel, Vice Chancellor, Sardar Patel University, Vallabhvidyanagar, appreciated the appropriateness of the subject in the present situation of Indian society. He said that the problem of human rights was like the principle of Action and Reaction — because the human rights are violated, the need of their protection arises. In his keynote address Principal R.C. Talati spoke of the relevance of Human Rights in various fields of the society. He emphasised that education can play a very important role in spreading knowledge of human rights to depressed classes of society such as scheduled castes, scheduled tribes, child labour, depressed workers and the offenders.

Mr. Manubhai U. Patel, the president of Shri Ramkrishna Seva Mandal, in his presidential remarks, said : "Human Rights and Religion are one and the same thing. If we perform our religion well, the human rights are observed automatically. If we perform our duties well, our rights can be gained easily. We must not detach our rights from our duties".

Mr. Dipakbhai Patel, the editor and owner of the local news paper *Naya Padkar*, said "New sects in religion are emerging and the religious leaders are putting our democracy in danger. Now human rights are violated. This is rather high time to protect human rights. Due to fundamentalism, the religious people and their *gurus* are diving the country. They violate the human rights and spread fanaticism and fundamentalism. The religious leaders can play a greater role in maintaining human rights."

Mr. Kiritbhai Patel, Hony. Secretary of Shri Ramkrishna Seva Mandal said that human rights and our duties are the two sides of the same coin. If we do our duties well, the rights are achieved

We Congratulate...

Prof. Asis Datta, Vice-Chancellor, Jawaharlal Nehru University, New Delhi and Prof. Shiv Mangal Singh 'Suman', former Vice-Chancellor, Vikram University & President, AIU, who are to be conferred the Padma Shri and Padma Bhushan for their contributions in the fields of education and literature respectively.

by themselves. He said not the right but duty comes first.

The seminar was conducted in eight sessions at which eminent persons from different parts of the State expressed their views on Human Rights. They advocated that there should be equal rights for all irrespective of their caste, creed and gender. People should be made aware of their rights through education.

CSJM Honours Sen

Nobel Laureate Dr. Amartya Sen was awarded a D.Litt (Honoris Causa) of the Chhatrapati Shahuji Maharaj (CSJM) University, Kanpur, in recognition of his valuable contribution to the study of economics.

Accepting the award, Dr. Sen stressed the need for examining the influence of gender on the historical development of modern Indian languages. He said this aspect had interested him as he was as keen in the study of philosophy as he was in economics. "It is extremely important from the standpoint of research into the growth of the contemporary feminist movement to understand why some languages remain faithful to gender while others do not", he said.

He pointed out that languages like Bengali, Assamese and Oriya had discarded gender some time between the seventh and twelfth centuries.

At present, the Bengali language stresses gender only in the case of a few adjectives, and few nouns and pronouns. In this respect the three languages belonged to a rare group in the world. Only Turkish, Finnish and English — where gender was stressed only in the case of pronouns and few nouns — could be included. He urged the university authorities to conduct research into an interesting parallel which he had discerned between the development of Hindi and most other Indo-European languages and French.

The French language, he pointed out, laid great stress on gender, very much like classical Sanskrit where there were three genders. The growth of the modern feminist movement had raised the valid demand for de-gendering common nouns. Dr. Sen said that he had developed a style of using the masculine and feminine alternatively.

Seminar on Water and Sanitation

The Global Science Academy, an NGO serving Science, Environment and Society, Basti (UP) proposes to organise a National Seminar on 'Water and Sanitation in relation to public health' at Basti on the World Environment Day, June 5, 1999.

The purpose of the seminar is to bring together participation from a wide variety of interests to explore the possibilities to solve important water related problems and to create a forum for discussion, and hopefully, a consensus on how scientific principles and awareness can be combined in order to create conditions for real breakthrough in present disastrous situation in sanitation and drainage sector.

Topics proposed to be discussed in technical sessions include : Water and Microbial contamination; Water borne health problems and their control; Sanitation and prevention of infectious diseases; and Problems of Water and Sanitation; role of government, scientists and people.

Further details may be obtained from Mr. Anil Pratap Singh, Secretary, Global Science Academy, Malviya Road, Basti-272 001.

Deccan College Diamond Jubilee

Deccan College, Pune proposes to organise Diamond Jubilee Celebrations during 1999. As part of the programme special lectures by senior outside scholars will be organised in Sanskrit Studies, Medieval/Maratha History, Archaeology, and Linguistics.

A special volume of the annual Bulletin of the Institute is proposed to be brought out giving details about the contributions made by the Institute over the last sixty years in Archaeology, Linguistics, Medieval/Maratha History and Sanskrit Studies.

An exhibition in Pune city will be organised to draw the attention of the public to the results of archaeological excavations and other achievements.

A special theme-oriented national Seminar in Archaeology on the topic of Site Formation Processes is also proposed to organised on the occasion.

Nehru Birth Centenary Awards

The Indian National Science Academy (INSA) has announced the following : Jawaharlal Nehru Birth Centenary Medal, Lectures and Visiting Fellowship.

Jawaharlal Nehru Birth Centenary Medal (1999) : Professor Francois Gros, Perpetual Secretary, French Academy of Sciences, France.

Jawaharlal Nehru Birth Centenary Lectures (1999) : 1. Professor Asis Datta, FNA; 2. Professor DVS Jain, FNA.

Jawaharlal Nehru Birth Centenary Visiting Fellowship (1999) : Professor M Vijayan, FNA.

IT and Social Sciences

The National Social Science Documentation Centre, ICSSR, New Delhi, proposes to organise a Training Workshop on "Use of Information Technology to Access Social Science Information" on 10-13 March, 1999 at Bangalore. The workshop is intended for Social Scientists/University Teachers/ Research Scholars/Information Specialists and Librarians/Other Social Science Information Users in Business, Government etc.

The topics proposed to be covered include (i) IT state of the art, supporting technologies, and relevance in the context of accessing social science information; (ii) Social science, information sources and their specific nature, availability and accessibility; (iii) Multimedia and CD-ROM databases, Online searching, and Internet; and (iv) Digital libraries : virtual libraries.

Further details may be obtained from Dr. K.G. Tyagi, Director, National Social Science Documentation Centre, 35, Ferozshah Road, New Delhi-110 001.

News from Agricultural Universities

PAU-TAFE Collaboration for Farm Machinery

The Punjab Agricultural University (PAU), Ludhiana and Tractors & Farm Equipment Limited (TAFE), Chennai propose to work in close collaboration for development and testing new farm machinery and equipments. The TAFE will design and develop new machines and equipments and the engineers of Punjab Agricultural University will test these in the farmers' fields and suggest improvements. This was revealed by Ms. Mallika Srinivasan, Director, TAFE while addressing the Convocation and Prize Distribution Function of the College of Agricultural Engineering, PAU, Ludhiana recently. The offer was welcomed by the Vice-Chancellor, Dr. G.S. Kalkat in his presidential address.

In her address Ms Mallika Srinivasan stressed the need for the development of a growth model, aimed not just at short term gains of productivity but one which was sustainable in the long term. This was necessary to meet the current agricultural problems like depletion in the water table, deterioration of soil health, multiplication of pests and diseases, lack of organic carbon in the soil, proliferation of obnoxious weeds and the formation of an impervious layer that prevented the uptake of water and nutrients from deeper layers. Further elaborating her point she said that the use of Chisel Plough did not compact the soil, caused hard pans or upset the level of the field. A sub-soiler in vegetable cultivation would provide drainage facility and soil aeration in deeper zones. The Rotavator and the Strip-Till Drill were other examples of eco-friendly equipment that was in widespread use internationally but only beginning to be used in India, she said adding that countries like USA had led the way in evolving an approach that blended productivity and long term sustainability concerns with adoption of concepts like conservation tillage which left a protective residue on the soil that reduced soil erosion in a cost effective manner. She urged the outgoing agricultural engineers to demonstrate their entrepreneurial skills in the setting up of Farm Machinery Syndicates and Farm Machinery Contact Firms, similar to those operating in Europe and North America. These syndicates would enable access to specialized tractors and equipment that could give dramatic improvements in farm incomes but were beyond the reach of the average farmer, she emphasised.

Dr. G.K. Kalkat, Vice-Chancellor of the Punjab Agricultural University presided over the Convocation and also awarded 138 B.Tech. degrees. He also awarded four Gold Medals and 25 Merit Certificates to the successful graduates for their outstanding achievements. In his presidential address Dr. Kalkat suggested that all the farm operations should be fully mechanised whereas at present only some operations were mechanised and for others there was a heavy dependence on labour. The full farm mechanisation would decrease the cost of production and would also help bring down the use of pesticides which at present was the highest in Punjab. He suggested the development of equipment to uproot the paddy stubbles, so as to expose and kill hibernating larvae of stem borer. He also urged the agricultural engineers to help in setting up post-harvest units in rural areas, so as to minimise the wastage of farm produce during storage and transport. At present 10% of the foodgrains, 25% of the fruits and vegetables and 30% of fish and meat products get perished due to faulty handling and storage.

Dr. H.S. Sekhon, Dean, College of Agricultural Engineering, said that during the B.Tech. study programme an effort was made to develop all the facets of the personality of the students so that they were not only competent engineers but also had the right type of attitude and sense of responsibility towards the society. He also disclosed that more than 20 teachers of the College had won awards and distinctions from different quarters at the national level. While elaborating the research achievements of the College, Dr. Sekhon disclosed that the three machines i.e. Tractor Drawn Steip Till Drill; Manual Oil Seed Drill and High Clearance Sprayer had been developed and recommended for use by the farmers and nine other machines were at different stages of research and development and held promise for popularisation in the state.

News from UGC

Countrywide Classroom Programme

Between 1st and 7th February, 1999 the following schedule of telecast on higher education through INSAT-1D under the auspices of the University Grants Commission will be observed. The programmes are telecast on the Doordarshan's National Network from 9.30 to 10.00 a.m. every day except on Saturdays & Sundays. These programmes are also telecast on Doordarshan's National Network from 6.00 to 6.30 a.m. two days a week i.e. on Saturdays and Sundays. On DD2 International Programme will be shown at 11.00 to 12.00 hours on Saturdays only.

Hindi Programmes are being telecast on Mondays to Fridays from 6.00 to 6.30 a.m.

1.2.99

"Insight Foresight"
"Touch of Genius"

2.2.99

"Disha-5"

3.2.99

"Fisheries"
"Life Unreached — Causes of Infertility-2"

4.2.99

"Question Time-99"
"The Golden Yarn — Silk"

5.2.99

"Be Fit ! Stay Fit"
"Touch of Genius"

6.2.99

"An Agenda for Education"

7.2.99

"Jagoi"

Hindi Telecast

प्रात: 6.00 से 6.30 बजे तक

1.2.99

"एक वृक्ष-एक लता लुनैर की सम्पदा"
"खजूर का तेल"

2.2.99

"जय नरायण व्यास : एक जुझारु व्यक्तित्व"
"तुलनात्मक भाषा की संकल्पना"

3.2.99

"दोलन गति : जटिल निकाय तथा अध्यारोपण"
"कहानी केसर की"

4.2.99

"वंदेमातरम् : जतीन्द्रनाथ दास"
"खुले आकाश की खोज में"

5.2.99

"राग एक चर्चा-2"

News from Abroad

Assessing Quality in Higher Education

An International Conference on Assessing Quality in Higher Education will be held on July 23-25, 1999 at Manchester, England. The Conference is sponsored by Indiana University-Purdue University Indianapolis in association with H + E Associates, U.K. and the Department of Quality Management, The University of Salford.

The purposes of this conference series are to : 1) promote awareness of current issues and perspectives on the assessment of quality in higher education worldwide, and 2) provide presentations by leading exponents of a variety of perspectives in a limited-enrolment environment designed to promote cross-cultural discussion and interaction.

This meeting — the eleventh in the series — aims to move the debate on these issues forward by enlarging the focus to include assessing quality in inter- or transnational and distance learning forms of higher education; assessing quality in workforce, professional and vocational education and training; and the assessment of both teaching and learning quality.

The topics proposed to be discussed include : Assessing Quality in International/Distance Learning Higher Education; The Development of Quality Assurance Policy; Quality and Faculty/Staff Development; Assessing Quality in Workforce/Vocational Education and Training; Total Quality Management in Further & Higher Education; Assessment of Teaching and Learning; and Assessment of Institutional Effectiveness.

Further details may be obtained from H+E Associates, Chris de Winter Hebron, Academic Director, 12a Church Street, Stiffkey, Near Wells-next-the-Sea, Norfolk NR23 1QJ England.

BOOK REVIEW

A Wonderful Book

R. P. Singh*

George John, Ed. V. V. John Omnibus. New Delhi, Har Anand Publications, 1998. Pp.688. Rs. 600/-.

In the field of education we do not have many outstanding speakers and writers of the stature of Professor V.V. John. His extraordinary command on language, his insight into problems of education, his wide reading and his broad vision, both singly and jointly make him eminently readable.The *Omnibus* carries everything that he wrote — satires, short stories, literary and critical essays and dialogues etc — most of which furnish object lessons for developing all around understanding. The contents of the *Omnibus* are: 24 speeches and addresses, 26 items pertain to the Book World, 36 pieces of satire, 9 short stories, 10 essays on history and biographies, 9 literary criticisms, 17 on miscellaneous writings and 4 are Socratic dialogues.

The reader has a choice to enjoy in his/her leisure hours some of the master pieces of Indian writing in English. The vast variety made available to the reader by itself merits commendation. While each and every word of Professor John is worth reading but depending on one's ability to understand/ appreciate there is enough to keep one busy for weeks on end. In fact, it is extremely unwise to grade the writings and make comparisons within. Each one sparkles like gem and what is most astounding is not merely their luminous character but their sheer abundance.

Let me illustrate my feelings with appropriate citations. What struck me the most is the canvas which V.V. John chose to utilize. The subject range is amazing. From corrupt and unstable politics to problems of literacy on the one hand and principles of translation, on writing English, co-existence and tolerance in a multi-religious society, quality of christian life, responsible parenthood etc on the other with Socratic dialogues and writeups on Sarojini Naidu, G.K. Chesterton, Somerset Maugham, Eric Gill etc thrown in between should give the reader not merely a wide choice but also an object lesson in life and living. Socrates is said to have declared that only 'reflective' life was worth living because it was better to be a dissatisfied Socrates than a satisfied pig. From the writing under review one could be sure that Prof. John had refused to be classed a pig.

John's essay on secularism, his observations on the issue of reservation, his write up on JP, his suggestion that a proper biography of Sardar Patel be written, his comments on Vinoba Bhave, Gandhiji etc and observations like "J.P. was usually diffuse, long winded and tentative in his formulations" and his quote from JP on the "betrayal of the intellectuals has started. The rats have begun to leave the sinking ship". etc should make a discerning and thoughtful reader desire to get hold of the book and read through it. I am no one to recommend the book, the book itself is inviting, "Come here and learn!", should have been in the sub-title itself.

That Prof. John was an inveterate democrat is more than obvious by his comment on India's commitment to non-alignment (p.597) vis-a-vis totalitarian states. He condemns India according respectability to the totalitarian states for its leadership role in the movement. If he were writing today perhaps he would have mentioned that one by one these structures have given way to provide indisputed hegemony to USA which is more dictatorial and tyrannical than the medieval potentates.

A wonderful book on the whole. Spelling errors due to poor proof reading however abound.

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Former Dean (research), NCERT, A-4/206, Kalkaji Extn., New Delhi-110 019.

THESES OF THE MONTH

A list of doctoral theses accepted by Indian Universities (October-November 1998)

AGRICULTURAL & VETERINARY SCIENCES

Agriculture

1. Anil Kumar. **Long term effect of chemical fertilizers on yield and soil fertility changes in maize wheat system.** Department of Agronomy, Punjab Agricultural University, Ludhiana.

2. Bhadwal, Mohinder Singh. **Ultrasonographic studies on characteristics of abdominal organs, tendons and joints in health and disease in dogs.** Department of Veterinary Sciences, Punjab Agricultural University, Ludhiana.

3. Chawla, Aneesh. **Effects of irrigation and nitrogen rates on water use and yield of sugarcane.** Department of Soils, Punjab Agricultural University, Ludhiana.

4. Iqbal, Saleem. **Isolation and identification of rumen cellulolytic bacteria from buffalo and their role in digestion.** Department of Veterinary Sciences, Punjab Agricultural University, Ludhiana.

5. Mathiyalagan, Peru. **Estimation of technological needs of poultry farmers.** (Dr R Krishnaraj),Department of Veterinary Sciences, Tamilnadu Veterinary and Animal-Sciences University, Chennai.

6. Meganathan, N. **Determinants of livestock development in Tamil Nadu.** (Dr R Prabaharan), Department of Veterinary Sciences, Tamil Nadu Veterinary and Animal Sciences University, Chennai.

7. Naresh Kumar. **Physiopathological and biochemical changes in dogs during experimentally produced haemorrhagic shock followed by blood transfusion.** Department of Veterinary Sciences, Punjab Agricultural University, Ludhiana.

8. Panchapakesan, S. **Progesterone level and superovulatory response in Kangeyam and cross bred cows treated with PMSQ and FSH.** (Dr D Kathiresan), Department of Veterinary Sciences, Tamil Nadu Veterinary and Animal Sciences University, Chennai.

9. Pandurang, Kadu Popat. **Nutrient requirement of pre-seasonal and seasonal sugarcane by conjoint use of organic manures and chemical fertilizers based on soil testing.** (Dr K R Sonar), Department of Agriculture, Mahatma Phule Krishi Vidyapeeth, Ahmednagar.

10. Reddy, Gunna Rajender. **Management of swell shrink soils through tillage, intercropping and crop residues.** (Dr G U Malewar), Department of Agril Chemistry and Soil Science, Marathwada Agriculture University, Parbhani.

11. Saini, Simratpal Singh. **Studies on alteration in pharmacokinetics and dosage regimen of fluoroquinolones during hepatic and renal dysfunction in buffalo calves.** Department of Veterinary Sciences, Punjab Agricultural University, Ludhiana.

12. Selvaraj, R. **Physico - Chemical and palatability characteristics of certain commercial broiler strains.** (Dr A M Shanmugam), Department of Veterinary Sciences, Tamil Nadu Veterinary and Animal Sciences University, Chennai.

13. Tulasiram, Pachpute Shiwaji. **Accuracy & efficiency of dairy sire evaluation methods in triple crossbred cattle.** (Dr K M Kale), Department of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri.

Soil Sciences

1. Maruti, Amrutsagar Vijay. **Effect of Potash application to sorghum wheat sequence cropping on forms and quantity intensity parameters of potassium in an inceptisol.** (Dr K R Sonar), Department of Soil Sciences, Mahatma phule Krishi Vidyapeeth, Rahuri.

Veterinary Sciences

1. Patil, Vilas Dattatray. **Assessment of chemical and biochemical indices for diagnosing zinc difficiency and soil associated factors of citrus (citrus sinensis L. osbeck) nutrition.** (Dr G UM Malewar), Department of Agriculture Chemistry and Soil Science, Marathwada Agricultural University, Parbhani.

BIOLOGICAL SCIENCES

Botany

1. Ahmad, Altaf. **Physio-chemical studies on the interactive effect of sulphur and nitrogen on seed and oil yield of rapeseed mustard.** (Dr M Z Abdin), Department of Botany, Jamia Hamdard, New Delhi.

2. Banerjee, Subhas. **Effects of plant growth regulators on sex expression and fruit development in a few cucurbits.** (Dr Priti Sadhan Basu), Department of Botany, University of Burdwan, Burdwan.

3. Chatterjee, Soumendra Nath. **Studies on anopheles subpictus in relation to malaria transmission in a rural area of West Bengal, India** (Dr Goutam Chandra), Department of Botany, University of Burdwan, Burdwan.

4. Ghosh, Malay. **Mycoprotein production through degradation of plant biomass.** (Dr Balen Nandi), Department of Botany, University of Burdwan, Burdwan.

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13. Vanila Kumari, E. **Ecological studies on some cryptonemiales (Rhodophyceae_)of the Visakhapatnam coast.** (Prof G Subbarangaiah), Department of Botany, Andhra University, Waltair.

Life Sciences

1. Pandey, Sona. **Biochemical and molecular characterization of a plant calcium/calmodulin dependent protein kinase and its regulation during development.** (Prof S K Sopory and Dr N B Sarin), Department of Life Sciences, Jawaharlal Nehru University, Delhi.

Zoology

1. Banu, Hanifa Z. **Effect of dietary supplementation on mass and water utilization budgets in silkworm Bombyx Mori (L)** (Dr M R Delvi), Department of Zoology, Bangalore University, Bangalore.

2. Dasgupta, Sangita. **Some aspects of morphology histochemistry and biochemistry of three nematodes locating at different regions of alimentary canal of herons of West Bengal.** (Dr Anadi Prasad Nandi), University of Burdwan, Burdwan.

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12. Singh, Krishna Kumar. **Some Haematological and other studies in the silkworm bombyxmori (linnaeus) during the course of a viral desease.** (Dr C J Savanurmath), Department of Zoology, Karnatak University, Dharwad.

EARTH SYSTEM SCIENCES

Earth Sciences

1. Chanu, Akoijam Anita. **Geochemical and radiogenic isotopic study of groundwater of Imphal area, Manipal.** (Prof Rajesh Anand), Earth Sciences Department, Manipur University, Imphal.

Environmental Sciences

1. Mohanta, Manoj Kumar. **Geochemistry and nuclear energy potential of the granitic gneisses around Ramagiri Gold fields.** (Prof V Rajamani), Department of Environmental Sciences, Jawaharlal Nehru University, Delhi.

2. Roy, Aniruddha. **Studies on the environmental impacts of limestone mining and slope instability using remotely sensed and ancillary data-case studies from southern Himachal Pradesh.** (Prof S P Banerjee), Department of Environmental Sciences, Indian School of Mines, Dhanbad and (Dr R Nagarajan), Indian Institute of Technology, Bombay.

Geology

1. Francis, Anto K. **Chemistry and metamorphic history of granulite facies lithologies and associated rock types of Kambam valley, Tamil Nadu.** (Prof Janaradhan A S), University of Mysore, Mysore.

2. Gray, Malladi Lucy. **High resolution studies of late quaternary planktonic foraminifera from deep sea Bengal fan : paleoceanographic implications.** (Dr T Y Naidu), Department of Geology, Andhra University, Waltair.

ENGINEERING SCIENCES

Electrical Engineering

1. Janardanan, E G. **Control of D C drives using neural net work.** (Dr F Gajendran), Department of Engineering, University of Calicut, Calicut.

Computer Science

1. Jagannathan S. **Coding of satellite image data.** Department of Computer Science, University of Mysore, Mysore.

Electronics

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Mechanical Engineering

1. Nagarajan M. **Feasibility studies of aluminium/copper graphite composite and its application to antennae.** (Dr S C Sharma), Department of Mechanical Engineering, University of Mysore, Mysore.

MATHEMATICAL SCIENCES

Mathematics

1. Madwarao, Hombali Chhaya. **Nevanlinna theory - exceptional values, fix points and normal families.** (Dr S S Bhoosnurmath), Department of Mathematics, Karnatak University, Dharwad.

2. Narayan Mahto. **Theoretical study of some problems of magnetohydrodynamic flow in a rotating medium.** (Dr G S Seth), Department of Mathematics, Indian School of Mines, Dhanbad.

Statistics

1. Anjuman Ara Begum. **Moments of concomitants of order statistics.** (Prof A H Khan), Department of Statistics, Aligarh Muslim University, Aligarh,

MEDICAL SCIENCES

Pharmaceutical Sciences

1. George, Bobby. **Studies on animal models of states epileptices and kindling epilepsyes gabaergic and glutamatergic modulation** (Prof S K Kulkarni), Department of Pharmaceutical Sciences, Panjab University, Chandigarh.

2. Raji Reddy, **Role of neurosteroids in the modulation of the gaba-a and NMDA receptors and their psycho-phathophysiological implications.** (Prof S K Kulkarni), Department of Pharmaceutical Sciences, Panjab University, Chandigarh.

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1. Hegde, Ramakrishna. **The stage related structural and biochemical changes in erythrocytes infected with chloroquine sensitive and resistant strains of plasmodium falciparum: an in vitro study.** Department of Parasitology, Postgraduate Institute of Medical Education and Research, Chandigarh.

PHYSICAL SCIENCES

Applied Chemistry

1. Jaibir Singh. **Interaction of organic pollutants and fly ash with soils and crops.** (Prof Samiullah Khan), Department of Applied Chemistry, Aligarh Muslim University, Aligarh.

Biochemistry

1. Babu, T D. **Study of anticancer activity and mechanism of action of selected medicinal plants.** (Dr Jose Padikkala), University of Calicut, Calicut.

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1. Sharma, Rashmi. **Status of reactive oxygen species and antioxidant defense system in alveolar macrophages and periphera blood neutrophils of lung cancer patients.** Department of Biophysics, Postgraduate Institute of Medical Education and Research, Chandigarh.

Chemistry

1. Chaudhary, Sangeeta. **Synthetic experiments in terpenoids and sex pheromones.** (Dr G L Kad and Dr I R Trehan), Department of Chemistry, Panjab University, Chandigarh.

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8. T Vijay Kumar. **Aquochlororuthenium (III), oxovanadium (IV) catalysed Br(V) oxidation of hydroxy and dicarboxylic acids: evaluation of individual kinetic and thermodynamic parameters.** Department of Chemistry, Kakatiya University, Warangal.

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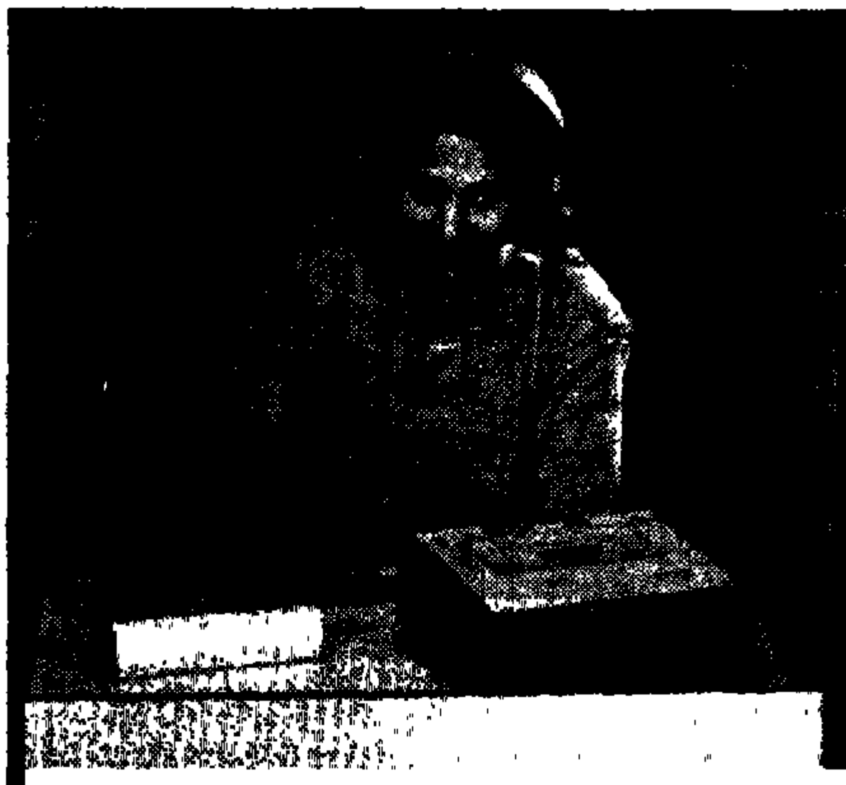

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